LIBRARY OF CONGRESS.
Chap. RC 202 Copyright No.
Shelf F48
UNITED STATES OF AMERICA.

GONORRHŒA

BEING THE TRANSLATION OF

BLENORRHŒA OF THE SEXUAL ORGANS

AND ITS COMPLICATIONS

BY

DR. ERNEST FINGER

Docent at the University of Vienna

THIRD REVISED AND ENLARGED EDITION

With Seven Full-page Plates in Colors and Thirty-six Wood Engravings in the Text

APR 7 1894
CITY OF WASHINGTON
16462

NEW YORK
WILLIAM WOOD & COMPANY
1894

Copyright, 1894,
By WILLIAM WOOD & COMPANY

PRESS OF
THE PUBLISHERS' PRINTING COMPANY
132-138 W. FOURTEENTH ST.
NEW YORK

PREFACE TO THE THIRD EDITION.

THE favorable reception which the first two editions of my monograph received from the medical profession is a sufficient reason for avoiding material changes in the present edition of the work. I have merely attempted to add the experiences and advances which have been made since the appearance of the second edition. During the last few years much attention has been devoted to the subject of gonorrhœa, and our knowledge in this direction has been considerably enlarged. The possibility of more ready culture of the gonococcus, and greater precision in the question of mixed infections, constitute important achievements. On the other hand, I have been able, through the great kindness of Professor Weichselbaum, to make the first systematic anatomical examinations of chronic urethritis. These points form the principal changes and additions to be found in the present edition. The two additional plates (VI and VII) are intended to illustrate anatomical conditions. I have also endeavored in other ways to keep the work up to the modern standpoint. May this edition meet with the same good fortune as its predecessors.

THE AUTHOR.

VIENNA, *June*, 1893.

CONTENTS.

PAGE

History, ... 1
Etiology, ... 9

CHAPTER I.

BLENORRHŒA IN THE MALE AND ITS COMPLICATIONS.

Urethral Blenorrhœa, ... 23
Anatomical and Physiological Remarks, ... 23

CHAPTER II.

ACUTE URETHRITIS.

Infection, ... 41
Symptomatology, ... 45
Acute Anterior Urethritis, ... 46
Posterior Acute Urethritis, ... 62
Diagnosis and Differential Diagnosis, ... 73
Prognosis, ... 79
Anatomy, ... 81
Treatment, ... 90
Oversight of the Remedies, ... 97
Local Remedies, ... 105
Methods, ... 117
Treatment of Anterior Urethritis, ... 119
Treatment of Acute Posterior Urethritis, ... 132

CHAPTER III.

CHRONIC URETHRITIS.

Etiology, ... 138
Symptomatology, ... 141
Chronic Anterior Urethritis, ... 143
Chronic Posterior Urethritis, ... 145
Secretion, ... 149
The Infectiousness of Chronic Gonorrhœa, ... 154

PAGE
Localization, ... 155
Pathological Anatomy, ... 169
Pars Anterior, ... 171
Pars Posterior, ... 175
Diagnosis and Differential Diagnosis, ... 181
Prognosis, ... 188
Treatment, ... 189

CHAPTER IV.

COMPLICATIONS OF BLENORRHŒA IN THE MALE.

General Remarks, ... 204
Balanitis, ... 207
Etiology, ... 207
Symptomatology, ... 209
Diagnosis and Differential Diagnosis, ... 212
Treatment, ... 214
Follicular and Cavernous Infiltration and Abscesses, ... 215
Symptomatology, ... 215
Treatment, ... 221
Inflammation of Cowper's Glands, ... 222
General Remarks, ... 222
Symptomatology, ... 223
Diagnosis and Differential Diagnosis, ... 225
Prognosis, Treatment, ... 226
Inflammation of the Prostate, ... 226
General Remarks, ... 226
Symptomatology, ... 227
Chronic Prostatitis, ... 232
Pathological Anatomy, ... 232
Diagnosis and Prognosis, ... 233
Treatment, ... 234
Inflammation of the Epididymis, ... 236
General Remarks, ... 236
Symptomatology, ... 240
Pathological Anatomy, ... 249
Diagnosis, Prognosis, ... 252
Treatment, ... 252
Inflammation of the Seminal Vesicles, ... 258
Inflammation of the Bladder, ... 259
General Remarks, ... 259
Symptomatology, ... 261
Diagnosis and Differential Diagnosis, ... 265
Pathological Anatomy, ... 266
Prognosis, Treatment, ... 267
Inflammation of the Renal Pelvis and Kidney, ... 270

CHAPTER V.

BLENORRHŒA IN THE FEMALE.

PAGE
General Remarks, ... 271
Urethritis, ... 277
General Remarks, ... 277
Symptomatology, ... 277
Pathological Anatomy, ... 280
Diagnosis and Prognosis, ... 281
Treatment, ... 281
Vaginitis, ... 282
General Remarks, ... 282
Symptomatology, ... 283
Diagnosis and Prognosis, ... 285
Treatment, ... 286

CHAPTER VI.

COMPLICATIONS OF BLENORRHŒA IN THE FEMALE.

Vulvitis, ... 290
General Remarks, ... 290
Symptomatology, ... 290
Diagnosis, ... 292
Treatment, ... 292
Inflammation of Bartholin's Glands, ... 293
General Remarks, ... 293
Acute Bartholinitis, ... 294
Symptomatology, ... 294
Treatment, ... 295
Chronic Bartholinitis, ... 295
Treatment, ... 297
Inflammation of the Uterus and its Appendages, ... 297

CHAPTER VII.

COMPLICATIONS OF BLENORRHŒA IN BOTH SEXES.

Gonorrhœal Rheumatism, ... 302
General Remarks, ... 302
Etiology, ... 302
Symptomatology, ... 304
Pathological Anatomy, ... 309
Diagnosis and Prognosis, ... 311
Treatment, ... 312
Blenorrhagic Endocarditis, ... 312
Blenorrhagic Exanthemata, ... 315
Blenorrhagic Ophthalmia, ... 315
Blenorrhagic Adenitis, ... 316

BLENORRHŒA OF THE SEXUAL ORGANS.

HISTORY.

Although the views concerning the antiquity, development and origin of constitutional syphilis are very divergent, and the documents and data which testify to the knowledge of this plague in the time of the Jews, Romans and Greeks are so scanty and obscure, that we must strongly doubt whether this mooted question will ever be definitely settled, nevertheless we may maintain with positiveness that blenorrhoic disease of the genitalia are as old as the human race. At all events they can be traced back historically almost as far as the history of man, and appear at the same time as the latter out of the mythical obscurity of legends and tradition. We find at least, among the cultivated nations of antiquity as well as of the Middle Ages, in part appropriate descriptions of the symptoms of blenorrhagic affections, in part unmistakeable indications that the etiology, the contagious character of the disease, had not escaped observation. This original clearness and correct knowledge gave way to confusion when, almost coincidently with the discovery of America, syphilis traversed Europe as a pandemic,—whether as a new disease may be doubted, but at all events with hitherto unknown virulence. The relatively mild and harmless symptoms of blenorrhœa were of no importance compared with the severe manifestations of syphilis, the majority of which also started from the sexual organs, and thus blenorrhœa sank into oblivion, at least among medical writers. And in the same measure that the violence and malignancy of syphilis gradually diminished,

blenorrhœa again became the subject of observation and study; the knowledge that both diseases were localized generally in the genitalia, often occurred together and were both contagious, led to their being grouped together, and to blenorrhœa being regarded as a symptom of syphilis. Although this view did not remain unopposed, it prevailed for a long time, and not until the middle of the eighteenth century did the number of voices which advocated the separation of blenorrhœa from syphilis become greater and their importance more and more considerable. Finally, the separation became definitive in the thirties of the present century.

Thus we can distinguish three periods in the interesting history of blenorrhœa, the first period—until the occurrence of syphilis—in which blenorrhœa stood alone; the second—until 1830—which represents the period of confusion; the third period, beginning with 1830, and which continues to the present time.

First Period: until the occurrence of Syphilis as a Pandemic.—Numerous texts prove that blenorrhœa was known to the civilized nations of antiquity, and that it was also regarded by them as contagious.

Thus the Jews knew blenorrhœa very accurately, and in Leviticus iii. 15, Moses not alone gives a description, but also sanitary and police regulations which testify to accurate knowledge of the disease.

Whether the words used concerning David's disease in Lev., Chap. xv., refer to this affection must remain in doubt.

Maimonides describes blenorrhœa clearly. He says: the fluid escapes without erection and without a feeling of pleasure; the appearance is similar to that of barley dough in water, which is dissolved, or coagulated albumen, and is the result of the internal disease; it is also essentially different from the seminal fluid and mucus, the latter being more homogeneous. Maimonides mentions seven causes of the disease, including amorousness and excesses.

Blenorrhœa was also well known to the Greeks and Romans. Thus, Herodotus relates that the Scythians, who had violated the shrine of Venus-Urania, were attacked by the morbus femineus of the νοῦσος θήλεια. Hippocrates speaks of the sensation of burning during micturition and of the white discharge of women. Celsus mentions ulcers in the urethra and the dis-

charge of bloody, purulent matter from the canal. Corresponding texts are found in Juvenal, Martial, Dioscorides, Scribonius Largus, Sextus Placidus, Pliny and Galen. Galen, in particular, separates satyriasis, the escape of semen from the erect penis, from gonorrhœa, the escape of semen without erection. Aretæus distinguishes vaginal blenorrhœa from fluor, and Marcellus Empyricus, Physician to the Emperor Theodosius, mentions remedies.

The statements of writers of the Middle Ages concerning blenorrhœa are more numerous and detailed, above all those of the Arabists. Thus, we read in Johannes Mesue, who lived in the tenth or eleventh century: *Si vero in via et ductu urinæ ulcera sunt, cognoscuntur ex dolore magis in urinæ egressione et sanie egrediente ante urinam. Ulcera virgæ et apostemata sunt proportionalia ulceribus et apostemalibus testium.* Haly Abbas speaks of an urethritis which is accompanied by a white discharge and pain in urination. Rhages discusses burning during micturition. He recommends bolus armena, dragon's blood and injections in purulent discharges from the urethra. Serapion also discusses blenorrhœa, ulcers in the urethra, which provoke pain and purulent discharge. He defines gonorrhœa as increased involuntary discharge of semen and recommends hemp seeds against it. He also gives a good description of the suppurations of the female genitalia, which result from excessive coitus. Ebn Sina describes clap as follows: *Sentitur acuitas et mordicatio in egressione et quandoque est cum ea ardor urinæ, et est color ejus ad citrinitatem declivis.* In the eleventh century Abulcasem used injections of a mixture of vinegar and water in gonorrhœa.

In the other writers of the Middle Ages we also find descriptions of blenorrhœa, as well as some police ordinances for the prevention of its spread by prostitutes. Gariopontus discusses gonorrhœa, and Michael Scotus, physician to the Emperor Frederick I., recognizes its infectious nature. Rogerius, a physician of the twelfth century, treats of *reumatisatio virgæ: Quando reumatisant humores ad canales virgæ, et faciunt ibi pustulas et apostemata, si fiat de calida causa, cognoscitur per calorem, per punctionem et arsuras, per ruborem et inflammationem membri. Si fiat de causa frigida, cognoscitur per remotionem punctionum, et mordicationem et per exclusionem ruboris; in utraque*

causa difficultas mingendi. Lanfrancus, a pupil of William de Saliceto and a distinguished physician of the 13th century, speaks *de apostematibus virgæ* in the following terms: *Aliquando repletur virga ventositate grossa, ipsam cum dolore nimis extendente, cum autem cessat materiæ cursus, si vero apostema testiculi induretur.* Constantinus Africanus recommends remedies against strangury. Joannes Ardern, a physician of the 14th century, recommends sedative injections against blenorrhœa. Guido de Cauliaco speaks, in his Surgery of burning and disease of the penis from intercourse with a diseased woman. Joannes de Gaddesden recognized urethritis and epididymitis, he was also acquainted with vaginitis. Similar statements are found in Valescus de Taranta, Gulielmus Varèguana, Magninus, Joannes Arculanus, Joannes de Tornamira, Antonio Cermisone and many others, which leave no doubt that blenorrhœa was very well known, was regarded as contagious, and treated with local remedies. That the contagious character of blenorrhœa was generally recognized is shown above all by some police ordinances which have come down to us. Thus, Beckett reports an ordinance of the Bishop of Winchester for the houses of prostitution of Southwark, a suburb of London, which, eighteen in number, are said to have been under the supervision of this Bishop. This ordinance dates back to the year 1162. One of its articles reads as follows: *De his qui custodiant mulieres habentes nefandam infirmatatem,* and begins thus: "That no Stewholder keep noo woman wythin his hous, that hath any sycknesse of Brenning," or, as is said in a similar ordinance of this Bishop, "the perilous infirmity of burning."

An ordinance concerning the establishment of a house of prostitution in Avignon, which is attributed to Johanna I., Queen of both Sicilies, is dated August 8th, 1347. The fourth article of this ordinance reads: "The Queen commands that the superintendent and a surgeon appointed by the authorities examine, every Saturday, all the whores in the house of prostitution. And if one is found, who has contracted a disease from coitus, she shall be separated from the rest and live apart, in order that she may not distribute her favors, and may thus be prevented from conveying disease to the youth."

All these quotations show sufficiently that blenorrhœa existed in antiquity and the Middle Ages, that its nature and

contagious character were recognized, and that prophylactic and therapeutic measures against it were adopted. Then towards the end of the 15th century syphilis appeared upon the scene, and spread rapidly with hitherto unobserved intensity. What wonder that the attention of the medical public was directed exclusively to the new and malignant disease, that blenorrhœa sank into comparative oblivion and that thus begins

The Second Period, that of Confusion.—It would be going too far to assume that the newly developed syphilis had cast gonorrhœa into complete oblivion. This is not true. It was merely that the new and interesting disease diverted attention and study from the old and known, but without causing it to be forgotten. Thus, the contemporaries of the first great epidemic of syphilis speak incidentally of blenorrhœa as a disease long known, or they do not mention it at all in the treatises devoted to the new affection. Thus, Grunpeck (1496), Fracastor (1530), Mattheoli (1536), Massa (1536), do not mention gonorrhœa; Johannes de Vigo (1513) in his Surgery, in the chapter *de auxiliis œgritudinum virgœ*—speaks in detail of blenorrhœa and its treatment. Alexander Benedictus (1510) discusses syphilis and clap separately, as does Marcellus Cumanus, a military surgeon of the Venetian Army during the period of the first epidemic (1495). Jaques de Bethencourt (1527) relates the history of a chronic blenorrhœa. Paracelsus (1530) also recognized blenorrhœa, and mentions it as a possible complication of syphilis, like dropsy, podagra, paralysis, icterus and catarrh. In England Simon Fish (1530), Andrew Boord (1546), Michael Wood and William Bulleyn (1560) describe blenorrhœa, particularly in women, as a distinct disease, separate from syphilis. It seems to have been very widespread among prostitutes.

In opposition to these views Musa Brassavolus (1553) appears to have been the first to regard blenorrhœa as a symptom of syphilis, and, like the latter, as a new disease, whose origin dates to the year 1531. Nevertheless Brassavolus did not believe that symptoms of syphilis could develop from gonorrhœa. Gabriel Fallopius, the pupil of Brassavolus, coincides in this opinion of the syphilitic character of gonorrhœa. In a treatise published in 1563 we read: "the final symptom is Gallic gonorrhœa. Thirty years may elapse before this discharge begins." Tomitanus also accedes to the opinion

that blenorrhœa is a symptom of syphilis, and this belief prevailed for nearly two centuries. The results of this view were serious. Every clap was regarded as of equal importance to syphilis, and subjected to the most vigorous treatment with mercury, guaiac and sarsparilla. A few warning voices were raised, for example P. Haschard (1554).

It was not until the beginning of the 18th century that the opposition began, at first timidly, then more boldly, and thus *the third period in the history of blenorrhœa* was inaugurated. Cockburn's (1715) statement that blenorrhœa was not usually followed by symptoms of syphilis, remained unnoticed. This is also true of Boerhaave's (1753) admission. Balfour (1767) asks very timidly: *Nonnie potius suspicandum est, longe diversam esse materiam, quam luem paruit, ab ea, ex qua gonorrhœa efficitur.* Hales (1770) was the first to advocate the complete separation of the gonorrhœa and chancre virus, and Ellis (1771) made a large step in advance by making experiments subservient to his views. He also distinguishes the virus of syphilis from that of blenorrhœa. He says: "It seems most probable that there is something in the venereal particles of matter, in a gonorrhœa, which is very different in its nature and figure from that of the pox. * * * * The virus of the gonorrhœa, if exposed to any part denudated of its skin, will not form a chancre, but will heal with a little styptic wash, and any soft dressing, as I have observed in several cases." Bayford (1773) opposes Ellis' views because he never succeeded, with the aid of the microscope, in detecting any difference between the pus of clap and chancre. Tode (1774) combatted the identity of the virus of clap and syphilis, and likewise Duncan (1777), who adduces as an argument the fact that the inhabitants of Otahiti were acquainted with syphilis long before clap was imported among them. Harrison (1781) and Swediaur (1784), also employed the experimental method, but were led by their investigations to support the identity of both viruses. And thus the syphilidologists at the end of the 18th century were divided into two camps—the identists who believed in the identity of the virus of clap and syphilis, and their opponents, the dualists. Once again the scale turned in favor of the identists. John Hunter entered the arena. There are few names so popular in our specialty, and when Ricord and Sigmund are mentioned to-day, Hunter

is usually added as the third. Unfortunately with but slight justification. Not that we deny to Hunter ardent, even passionate devotion to his profession, great gifts and scientific earnestness, but it is rare that such qualities have produced poorer fruits, and have done less to forward a science than in the case of Hunter, very much to the disadvantage of the beginning freer development of our specialty. With the object of checking the battle between the identists and non-identists, and of getting at the truth of the matter, Hunter performed (May, 1767) upon himself, it is said, the following inoculation experiment, which proved so momentous to our science. One Friday, as he relates, he inoculated the gonorrhœal pus into the glans and prepuce by means of two incisions with a lancet. Both incisions were converted—that on the prepuce more rapidly, that on the glans more slowly—into pustules and superficial ulcerations, which were accompanied by inflammatory symptoms. Both spots were then cauterized repeatedly and slowly healed. During recovery swelling of the inguinal glands occurred, about three months later an ulcer appeared upon the tonsils, and three months later a copper-colored pustular eruption, *i.e.*, symptoms which could certainly be attributed to syphilis. Despite all previous experience this experiment was sufficient for the investigator, who was very quick in arriving at conclusions, to draw the inference that gonorrhœal pus may produce chancre. This single experiment involved a standstill—yes, a retrogression of more than sixty years—since even the shallowest follower of Hunter felt himself justified, relying upon Hunter's authority, his inoculation experiment and "personal experience," in breaking a lance for the unitist theory. It is true that Hunter distinguished a venereal from a simple clap, which could develop from other causes, or even spontaneously, but he did not clearly describe their differential diagnostic signs. And so began anew the struggle between the unitists and dualists, the former maintaining, through Hunter, the upper hand. Howard's (1787) opposition to Hunter's doctrines passed unnoticed. If the dualists claimed that constitutional syphilis never develops after clap — that the virus of clap never produces chancre, that of chancre never produces clap—that mercury cures syphilis but not clap—that clap and syphilis developed at entirely different periods—that clap generally

recovers spontaneously, syphilis never without the aid of art, —the answer given by the unitists was always the same. It is true, they said, that syphilis develops after a neglected clap, though not so often as after chancre—it is claimed that chancre virus does not produce clap and *vicè versa*, but experience proves the contrary; that mercury is not necessary to the cure of gonorrhœa is owing to the fact that the clap virus in the urethra is outside of the circulation, and its absorption is made difficult by the increased secretion of mucus; however, many gleets are not curable without mercury. Buboes, like clap, also existed prior to syphilis, and are nevertheless undoubtedly syphilitic in character.

Benjamin Bell (1794) was the first who, based upon a series of experiments, secured a hearing for his opposing views. Starting from the theory of the unitists that the same virus produces ulcers upon the glans penis and clap upon the mucous membrane of the urethra, he raises the following objections: *a.* Chancre should be more common than clap, since the outer surface of the glans is more exposed to infection than the mucous membrane of the urethra. *b.* Chancre should always be complicated with clap and *vicè versa*, since the pus from ulcers of the glans always passes into the urethra, the pus of clap always reaches the glans. *c.* The pus from the urethra is often so acrid that it excoriates the glans and prepuce but does not cause ulceration. *d.* Even the smallest chancre produces general infection. *e.* Clap and the erosions of the glans produced thereby do not give rise to syphilis. *f.* Chancre pus placed in wounds produces the venereal disease, the pus of clap does not, as the inoculation of two physicians with gonorrhœal pus showed. It would also be necessary to assume that a person who merely had a chancre conveys clap to another, and *vicè versa.* Clap is a discharge of pus-like material from the urethra, and is a local disease in every case; clap and chancre were present separately in different countries at different times. Mercury, which cures syphilis, is useless in clap.

Clossius (1797) coincided with Bell's opinions, Evans and Le Bon (1789) strengthened them by experiments, but Hernandez (1811) first exercised a decisive influence and became a forerunner of Ricord on account of the large number of his experiments (he inoculated seventeen convicts with gonorrhœal pus, always unsuccessfully).

The dispute concerning the identity of the virus of clap and syphilis led to the adoption of two extreme views. The investigations and experiments of Caron (1811) not alone induced him to deny the identity of the two poisons, but he denied the virulence of clap. Thus, Caron and his adherents, Jourdan (1826), Richond de Brus (1826), Devergie (1836), Desruelles (1826), taught that clap is devoid of any virus, that it is neither a virulent nor a contagious disease, but a simple genuine inflammation. In Germany, on the other hand, the careful study and observation of gonorrhœa and its course had led to its entire separation from syphilis, but its purely local character was also denied. It was regarded as a general disease and spoken of as a "clap diathesis." In the works of the adherents of this view—Authenrieth (1809), Ritter (1819), Eisenmann (1830)—we read not alone of clap but also of various sequelæ or metastases, such as lung clap, ear clap, gonorrhœal meningitis, clap ulcer, clap neuroses, gonorrhœal amaurosis, congenital and acquired clap diathesis.

Upon this confusion entered Ricord. Supported by large experience, critical and brilliant dialectic powers, but unfortunately, at the same time, deaf to all justifiable opposition to views which he had once regarded as correct, Ricord as the result of 667 inoculations, established the doctrine (1831 to 1837) of the non-identity of the virus of clap and syphilis, and advocated it so clearly and pertinaciously that all opposition soon ceased and this view seems settled for all time.

Although this question was settled, there developed with and on account of Ricord a new struggle, the struggle concerning the etiology of clap, and this we will consider in the following section.

Etiology.

Ricord's numerous inoculations and the acute reasoning which accompanied them definitively separated gonorrhœa from syphilis, and although an identist voice was occasionally raised, the theory of the identists like that of Caron and Eisenmann secured no adherents, although some distinguished specialists, like Vidal de Cassis and Simon, still favored it and now and then broke a lance for it. For the great majority gonorrhœa remained permanently separate from syphillis.

But now arose a second important question: If clap is not produced by the syphilitic virus, is it the product of a virus at all, or is it a simple, non-virulent inflammation? In addition to syphilitic clap—produced by the syphilitic virus, and which, in consequence of its development from the syphilitic virus was followed by syphilitic secondary symptoms—the adherents of the unitist theory, Brassavolus, Hunter and many others, had distinguished a simple genuine clap, which was supposed to occur as a simple catarrhal disease from various causes or even spontaneously. Now that the syphilitic clap disappeared, it was natural that the second variety, the simple clap, alone should be supposed to exist.

And this, in fact, was taught by Ricord. He denied the virulence of clap, and regarded it as a simple catarrh which may be due to various irritants. Among these irritants he attached the chief importance to gonorrhœal pus, which reproduced gonorrhœa merely by irritation, not as the result of a virus or contagious principle. But other secretions, menstrual, lochial and puerperal discharges and leucorrhœa, may also act as irritants and produce blenorrhœa. The same effect was said to result from acrid injections, introduction of instruments into the urethra, mechanical irritation, the ingestion of acrid food and drink. Even sexual excesses in perfectly healthy individuals, or mere long protracted sexual excitement and protracted erections without coitus or sexual contact, were said to produce clap. Ricord based these views in part upon previous experience, especially Swediaur's experiments, in part upon confrontations. He laid special stress on the fact that in confrontation in cases in which the male partner had acquired clap, the female was often found entirely healthy or often sufered merely from leucorrhœa, menstruation, etc., and the development of the clap must be attributed to one of the abovementioned causes. Finally, he called attention to acclimatisation, which renders one accustomed to it insensible to such irritation, but affects the new-comer with blenorrhœa. From all these experiences Ricord concluded that blenorrhœa is not a virulent disease, that it may develop without inoculation, that it may be acquired from the most innocent girl, the most virtuous wife. In his easy manner of presenting his views he even went so far as to devise a prescription for the means to be employed for surely acquiring blennorrhœa. I reproduce

it, since it not alone contains the quintessence of his views on this subject, but also furnishes an admirable characteristic of Ricord himself: "Do you wish to contract clap? This is the way. Take a pale, lymphatic woman, blond rather than brunette, and as leucorrhœic as possible. Dine with her; begin with oysters and continue with asparagus, drink a good many dry white wines and champagne, coffee, liqueur. All this is well. Dance after your dinner and make your partner dance. Warm yourself up, and drink a good deal of beer during the evening. When night comes, conduct yourself bravely; two or three acts of intercourse are not too much, more are still better. On waking do not fail to take a long warm bath and to make an injection. If this programme is carried out and you do not get the clap, it is because God protects you."

These statements of Ricord first led to the experimental production of blenorrhœa by the introduction of genuine pus. Thus, in two individuals, Voillemier introduced into the urethra bougies which had been smeared with pus from an abscess of the thigh and neck. The bougies remained in the urethra an hour without producing clap. Other similar experiments proved negative, but the production of clap was always successful when the pus was taken from another clap or from conjunctival blenorrhœa (which was soon recognized as identical), as shown by the experiments of Pauli, Guyomar and Thiry. Not alone was the difference between blenorrhagic and genuine pus determined in this way, but the advocates of the virulent nature of clap, the virulists, raised other objections based upon observation. Thus, it was emphasized that in properly regulated marital life, the development of clap was not observed despite leucorrhœa, menstruation, or even the ichorous discharge of a uterine cancer. This is also true of localities which are shut off from communication with the outside world, and thus prevent little opportunity for the importation of clap, despite vigorous sexual intercourse or even excesses on the part of the inhabitants. Thus Rosolimos relates that the Greek farmers, who are very continent before marriage and are very faithful in marriage but commit the greatest excesses are unacquainted with gonorrhœa. Michaelis reports that the physicians practising in Lippe often did not observe a case of clap for years. Milton states that for several years he was the sole practitioner in a small town, and during

this time treated several cases of clap, all of which proved to be imported, while he did not observe a single case acquired in the town, although there was no lack of opportunity for such acquisition. Further arguments are deduced from the course of blenorrhœa and comparisons with traumatic and chemically-produced urethral catarrhs. Thus, traumatic and chemical catarrhs develope immediately after the noxious action, have no tendency to propagation, but rather a tendency to spontaneous rapid recovery. On the other hand, virulent blenorrhœa has a period of incubation, a tendency to spread over the entire mucous membrane, and if not treated it does not heal spontaneously but passes into a chronic condition. The anti-virulists, who attributed the development of clap directly to the irritant action of the pus corpuscles and regarded the intensity of the action as proportionate to the number of pus corpuscles in the secretion, were told that a minimum amount of mucous secretion, and one very poor in pus corpuscles, from a beginning or a chronic blenorrhœa, would suffice to produce a violent clap.

In this way the struggle lasted for more than forty years, and sides were taken by very prominent writers. Among the anti-virulists were Acton, Hacker, M. Robert, Fournier, Langlebert, Geigel, Mueller, Bumstead, Tarnowsky, Jullien; among the virulists were Baumés, Hoelder, Reder, Milton, Belhomme, Martin, Lebert, Sigmund, Zeissl, Diday. Finally, the latter began to gain ground, the anti-virulistic theory lost more and more supporters. One circumstance contributed materially to this change. A group of investigators were not satisfied with discussing the question of the existence of a virus in an academic manner, but attempted to discover the nature of the virus itself, and to determine its action.

The theory that the virus of syphilis was a virus animatum was held at a remarkably early period of our specialty. Thus, in 1710, we read in a, it is true, very little known author, Deidier: "I believe that the venereal virus consists of nothing else but living maggots, which produce ova by copulation and which readily multiply as do all insects. These being assumed venereal diseases are explained much more readily than by any other hypothesis. . . . These maggots hatch and produce others and in this way we can assume the propagation of the venereal virus. How can it be supposed, as is done,

that pox could be carried from the Orient into Europe, and then pass, by commerce with a single prostitute, into the French army and thus to France, were it not for the venereal maggots which furnish a prodigious number of ova and which always find, in foul semen, the degree of putrefaction requisite to make them hatch?" However *naïve* the conception, the chain of thought is correct, and this man divined what could not be proven until two hundred years later.

The followers of Deidier also adhered to the theory of the *virus animatum*, which they sought to discover. Donné (1837) called attention to the presence of an infusorium, which he called "trichomonas vaginalis," in the pus of blenorrhœa vaginæ, and he concluded from his investigations that: 1. Purulent vaginitis is very often blenorrhagic, and that the purulent discharge ordinarily contains the trichomonas; 2. When it does not result from venereal infection, I am forced to conclude that it does not develop on account of these animalcules. Further investigations showed that the trichomonas was an accidental appearance, which is also present in healthy vaginal secretion. Jousseaume (1862) reports the discovery of an alga, which he called genitalia, in blennorrhagic pus. This discovery also proved illusory. Salisbury (1868) found threads of fungi and spores, which he called crypta gonorrhoica, in blenorrhagic pus; these were said to multiply in epithelium cells and to be found in the epithelium of the orifice of the urethra. Hallier (1868) published a similar discovery of a fungus with schizosporangia, which he called coniothecium; he produced cultures.

Thiry (1849) formulated different views. He investigated the contagious Egyptian eye disease, determined its blenorrhagic character by inoculations, made control inoculations of gonorrhœal pus into the eye, and came to the conclusion that in all these cases there was a contagious disease of the mucous membrane produced by the same virus. In the study of ocular blenorrhœa as distinguished from catarrh, the granulations appeared to him to be the essential characteristic; they were present in all cases of blenorrhœa, absent in all cases of catarrh. Inasmuch as blenorrhœa reproduces blenorrhœa, *i.e.*, granulations reproduce granulations, he defined the former as a specific, contagious process, characterized by the formation of granulations, and he applied the term "virus granuleux" to its contagious principle. There is no blenor-

rhœa without granulations, and hence Thiry demonstrated their presence in the blenorrhagic diseases of the vagina and uterus. Desormeaux (1865) showed their presence in the urethra by examination with the endoscope.

A decided change in this question did not occur until the new etiological impetus of pathological anatomy, which was prepared by Hallier, Pasteur and Klebs, and inaugurated by Koch, began to make its way. In 1879 A. Neisser reported a micrococcus peculiar to gonorrhœa, which he found constantly in the pus of clap and gonorrhœal conjunctivitis by means of Koch's staining methods. In 1880 these statements were confirmed by Bokai and Finkelstein, who not alone corroborated the constancy of occurrence of the gonococci, but also stated that they had cultivated them and had produced acute urethritis in two cases by inoculation of the cultures into the urethra. Further corroborative investigations followed rapidly. Weiss (1880) and Aufrecht (1880) noticed the presence of the gonococci in a large number of urethral blenorrhœas. Haab (1881) found that the cocci of blenorrhœa neonatorum were absolutely identical with gonococci. Hirschberg and Krause (1881) found the cocci in all cases of blenorrhœa neonatorum, but claimed to have demonstrated similar forms in simple catarrhs, and in the vaginal secretion of healthy women. Sattler, Hirschberg and Lebert (1881) agreed with the statements of Neisser. In 1882 Neisser himself published a detailed communication in which he describes the shape of the gonococci and their mode of increase, and also partly successful attempts at culture. Krause (1882) also reported similar results concerning blenorrhœa conjunctivæ. As the result of a large series of investigations Leistikow (1882) came to the conclusion that the microscopical demonstration of gonococci in a secretion proves its blenorrhagic character. Culture experiments which he made with Loeffler, proved unsuccessful. Ecklund (1882) stated that he found the gonococcus in all possible secretions, and therefore denies its specific character. On the other hand he found constantly, in blenorrhœa, a fungus, ediophyton dictyodes, which is also present in the discharges of summer diarrhœa and dysentery and in the urine in scarlatina, and this he claims is the virus of blenorrhœa (!!). In 1883 appeared a noteworthy publication by Bockhart. He first laid stress on the constant finding of gonococci in

258 cases of blenorrhœa, then reports the successful culture and inoculation of the pure culture in the urethra of a paralytic, who suffered in consequence from a subacute urethritis. At the autopsy (the patient died of pneumonia ten days after the inoculation) were found renal abscesses, pyelitis and cystitis, which were infiltrated with masses of cocci. Microscopical examination of the urethral mucous membrane showed inflammatory infiltration, with accumulation of cocci in the lymphatic vessels. Bockhart's results, both as regards the pure culture and inoculation and also the microscopical appearances, were combatted, the former by Loeffler, the latter by Arning. Loeffler denies the genuineness of the gonococcus pure culture, and Arning maintains that the cocci heaps described by Bockhart in the lymphatics were really mast cells. In the same year appeared corroborative articles by Eschbaum, Newberry, Campona, Marchiafava and Keyser. The latter examined 64 cases (30 whites, 34 negroes) of urethral blenorrhœa, and found the gonococcus constantly. They were absent only in two treated cases and in one recent case with scanty secretion. Equally positive results were afforded in three cases of ocular blenorrhœa in adults, and one case of blenorrhœa neonatorum. Numerous control examinations of various kinds of pus always gave negative results. Sternberg (1883), however, denied the specific character of the gonococcus, which he regards as identical with the micrococcus ureæ. In 1884 appeared the article by Zweifel, who showed that only gonococci-containing, but never gonococci-free, lochial secretion is able to produce blenorrhœa neonatorum. Bumm isolated a series of other diplococci found in the vaginal secretions, and studied their morphological characters and virulence by means of cultures and inoculations. He also claims to have found gonococci constantly in those lochial secretions which had given rise to blenorrhœa neonatorum. Welander reports similar results. In 25 confrontations, which he undertook, he found gonococci in both partners; inoculation of vaginal secretion, which was free from gonococci, into the male urethra always gave negative results, while he obtained typical positive results in three cases when small amounts of gonococci-containing pus were placed in the male urethra. Further positive results were obtained by Chameron, Wyssokowitch and Belleli, the latter making his investigations in an examination bureau for prostitutes.

Aubert found the gonococcus in more than 200 cases of blenorrhœa and he regards it as the most frequent cause of clap. But in a few cases of urethritis, which were followed by epididymitis and cystitis, he found no gonococci, but always the same variety of bacteria, so that, in addition to the most virulent and frequent blenorrhœa-producer, the gonococcus, he distinguishes other, less frequent, virulent micro-organisms. In 1884 Sternberg published a paper for the opposition, in which he denied the specific character of the gonococcus on account of the negative results of very questionable pure cultures. Gama Pinto found gonococci in all kinds of pus, so that he does not regard them as specific, but as secondary, since he often found them only at a late period, the third or fourth day of suppuration. Kroner distinguishes two forms of blenorrhœa neonatorum, a more frequent one with gonococci, a less frequent one without this bacterium. Saenger and Fraenkel combat the diagnostic significance of the gonococcus, whose absence does not exclude blenorrhagic disease. Oppenheimer studied the influence of various anti-gonorrhoics upon gonococci pure cultures. In 1885 Lundstroem and Kreis published similar experiments. The former examined 50 cases of acute and chronic urethritis, and always found gonococci. The virulent character of the gonococcus received further support from Martineau, Ferrari, Pezzer, Sinety and Henneguy. In 1886 Bockhart published investigations on 15 cases of "pseudo-gonorrhœal" urethritis, two of which were followed by epididymitis and were not produced by gonococci, but by other micro-organisms, as Bockhart proved by cultures and inoculation. Podres, Petersen and Crevelli furnished corroborating evidence based on large experience and numerous investigations, while Giovannini and M. v. Zeissl denied the specific character of the gonococcus. Schwarz (1886) pleaded for the gonococcus. Finally Bumm's treatise (1887) adduced abundant material and incontrovertible proof of the virulent character of the micro-organism. The possibility of making cultures of the gonococcus has been increased to such an extent, especially since the introduction of Wertheim's method (1891), and so many positive inoculations have been made, that doubt of the pathogenic character of the gonococci is hardly possible at the present time. In fact, its etiological significance is now rec-

ognized universally, except by a small group of French writers (Eraud).

And now, after this historical digression, we will direct our attention to the gonococcus itself, and examine its nature and the proofs of its virulence. Neisser's gonococcus is a diplococcus. Under feeble powers and unstained the gonococci appear as round or elongated round fungi, 1.25 m. long, 0.7 m. broad, but which, under high powers and after staining, are seen to be divided into two uniform halves by a bright line, a split. Each of these halves has an outer convex and an inner straight contour, both lie close to one another along the straight contour, so that only a thin slit remains between them. Each half of the diplococcus thus resembles a coffee bean. The gonococcus presents these characteristics in common with all diplococci. A further characteristic is furnished by the grouping. It is never grouped in chains, but is always found in small groups and clumps, and the number of single individuals in each group is not alone paired but is usually divisible by four. This grouping results from the peculiar mode of fission, as described by Neisser. Each diplococcus pair (Plate III., Fig. 4) divides in a line at right angles to the median fissure, so that from one diplococcus develop two double pairs, which are arranged like sarcina, but are usually a little more closely aggregated. Inasmuch as each single diplococcus pair again divides into a sarcina-like, double pair, and these shift from one another, groups develop in which many cocci pairs are still seen alongside one another in twos and twos. But these methods of division are also found in other diplococci. Like other bacteria, the gonococcus also possesses a great power of attraction for basic aniline colors, is readily stained by methyl violet, dahlia, gentian violet, fuchsin and methyl blue, but is decolorized with equal facility in alcohol and acids, according to Gramm's staining. This ready decolorization is a negative but extremely valuable diagnostic sign between the gonococcus and other forms of cocci, which usually retain a once imbibed staining much more vigorously and are not decolorized either by alcohol or acid, and particularly by Gramm's method. Roux (1886) recommended decolorizing according to Gramm, especially as a differential diagnostic sign. Allen (1887) was the first to advocate the differential diagnostic value of decolorization according to Gramm. Bumm (1887)

denied this, in view of the fact that other diplococci of gonorrhœal pus are decolorized by Gramm's method, but I (first edition of this work), and later Steinschneider and Galewsky (1889), have again emphasized its importance on the basis of careful investigations. The latter writers have shown that four kinds of diplococci are found in the normal urethra as well as in the secretion of blenorrhœa. The two more frequent ones retain a milky white and an orange yellow color after Gramm's staining, while the two rarer forms are grayish-white and citron yellow, occur only in the proportion of 4.6 to 4.8 per cent, and like the gonococcus are decolorized. Hence Gramm's decolorization of the gonococcus furnishes positive results in 95.35 per cent of the cases. Steinschneider and Galewsky color the cover glass for twenty-five to thirty minutes in aniline water gentian violet, then rinse the glass, then place the preparation for five minutes in the iodide of potassium-iodine solution. After repeated rinsing in water it is placed in absolute alcohol until the preparation is decolorized, and the alcohol which drips from the cover glass no longer has a violet color. After-staining in Bismarck brown. The gonococci then have a brown color; all other cocci are black from the combination of the gentian violet and Bismarck brown staining. Over-staining with Bismarck brown is to be avoided because this obliterates the difference in color. After-staining with fuchsin is more practicable. According to my experience the following is the best method of staining. The pus, which is spread upon the cover glass in the usual manner, dried and fixed by drawing it through the flame, is placed, with the charged side downwards, upon the solution of methyl blue. This is prepared by dropping a concentrated alcoholic solution of methyl blue into water or a solution of caustic soda (1 : 10000) in a watch glass until the fluid has a dark blue color. At the end of two minutes the cover glass is removed, washed with water, dried, and placed upon the object glass with Canada balsam. In this way the cocci appear dark blue and contrast very distinctly with the grayish-blue nuclei and the very pale blue protoplasm. Bumm recommends a practical rapid staining. The pus is spread in a thin layer upon the object glass with the blade of a knife, dried over the flame, drawn through the latter, exposed for half a minute to a concentrated watery solution of fuchsin, washed off, dried over the flame, and ex-

amined without a cover glass in the oil of the homogeneous immersion lens.

Schuetz (1889) recommends the following method for staining gonococci. The cover glass with the clap pus is placed for five to ten minutes in a 5-per-cent solution of carbol-methyl blue, then washed in distilled water and in dilute acetic acid (acid acetic dil. gtt. i.: aqua 50), and then stained with a watery solution of safranin. The gonococci have a blue color, the epithelium is pale blue, the pus cells, their nuclei, and the nuclei of the epithelium cells, are salmon color. This method is not reliable, and is unavailable for differential dignosis. Very beautiful results are furnished by a double staining with eosin-methyl blue, as done by Klein in Prof. Weichselbaum's Institute. The cover glasses, charged with clap pus, are first placed for forty minutes in a mixture of alcohol and ether, āā, and then for ten to fifteen minutes in an eosin-methyl blue solution (0.5 eosin in 100.0 concentrated watery solution of methyl blue); they are then washed in water, dried, and placed with Canada balsam on the object glass. The gonococci cell nuclei appear blue, the protoplasm salmon color. The intracellular position of the gonococci in the pus cells is especially distinct.

If we examine preparations of gonorrhœal pus treated in this way (Plate III., Figs. 5, 6, 7), we will usually be able to find numerous gonococci in groups, provided that the clap is recent and has not been treated. These groups are situated partly between the cells, partly—and this is characteristic of the gonococcus—in the pus cells. Thus, we find cells in which a single group or a few groups of gonococci are situated in the protoplasm, usually near the nucleus. In other cells the number of gonococci is larger, they extend on one side or the other to the edge of the cell, but never beyond it, thus proving their presence within, not upon the cell body. Finally, other cells are so full of gonococci that they conceal the nucleus. When this takes place the cells burst and the groups of cocci escape from the cells. We then find not infrequently that groups of cocci are arranged around one, two or three cell nuclei, but without the sharp contour of the cell body; they are generally aggregated more closely towards the middle, more loosely towards the periphery.

In order to prove the specific character of these cocci, it is

necessary not alone to demonstrate their constant occurrence in blenorrhagic secretion, but also to make pure cultures and inoculations with the result of producing a blenorrhœa. Apart from other observers who made statements concerning successful pure cultures, but whose nature as gonococci pure cultures was not proven by inoculation, or in which negative results were obtained, Bumm reports incontestable pure cultures. After several unsuccessful attempts this writer employed for cultures human blood serum, which he obtained from placentæ and sterilized in the well-known way. The pus of urethritis taken from the deep parts of the urethra, is spread in drops upon the blood serum, and the test tubes are then exposed to a temperature of 37° C. in the incubator. On the following day the gonococci have increased considerably in the drops which have sunk into the blood serum. This secretion which is infiltrated with numerous gonococci, is now conveyed in drops upon delicately gelatinized blood serum, upon which the migration of the gonococci from the secretion to the blood serum takes place. The growth of the culture ceases at the end of two or three days, and reinoculations must therefore be performed frequently.

The coccus colony now appears as an almost colorless, thin, lac-like shining coating of the surface of the blood serum, which presents a somewhat characteristic appearance from the fact that it has a tendency to spread in numerous jagged, steep projections. Transference of the culture to meat infusion, pepton, gelatin, agar, always was attended with negative results. The gonococci did not grow in these media.

In two cases Bumm found that the conveyance of a second and a twentieth generation of a gonococcos pure culture to the female urethra produced a typical acute urethritis, the pus of which contained numerous gonococci.

Soon afterward (1891), Aufuso made pure cultures of gonococci in the fluid of hydrarthros and obtained positive results on inoculating the male urethra.

Wertheim (1892) had done material service in cultivating the gonococcus and in demonstrating its pathogenic character. He returned to the plate method first recommended by Bockhart (1886). Human blood serum, obtained from the placenta, is treated with gonorrhœal pus; two dilutions are then prepared; and about 3 cm. of the preparation is mixed

with an equal amount of liquefied nutrient agar (2 per cent agar, 1 per cent peptone, 0.5 sodium chloride) and poured into plates.

Colonies, which are visible as delicate, whitish-gray dots, develop very rapidly, usually at the end of twenty-four hours. With low magnifying powers the deep colonies appear yellowish-gray, coarsely granular, while the superficial colonies show a delicate superficial layer around a compact, punctate centre. Inoculation of these colonies upon obliquely coagulated blood serum produces the delicate gray colonies described by Bumm, either with a jagged contour or consisting of small dots. Inoculation of this culture into the male urethra, in five cases, always showed a typical positive effect (two to three days' incubation, four to to five weeks' acute urethritis containing gonococci). The microscopical examination, shape, ready decolorization with Gramm's method, and cultures also undoubtedly proved that they were gonococci. The pure cultures thrive not alone upon blood-serum, but also upon simple nutrient agar with or without the addition of glycerin. They also thrive very well upon blood-serum agar (one part human blood serum, two parts bouillon-peptone agar), and here produce delicate, whitish patches, with serrated edges. They also thrive in a mixture of one part human blood serum with two parts peptone bouillon. Here they grow upon the bottom of the eprouvette as loose, transparent, scale-like crumbs, while the surface is covered by a delicate grayish-white layer. The serum of cow's blood mixed with peptone agar also furnishes an excellent nutrient for the gonoccoccus.

A material simplification of the method of culture was devised by Ghon and Schlagenhaufer in Prof. Weichselbaum's Institute. Their experiments are not yet completed, but, with their permission, I publish the following notes. Wertheim had produced direct pure gonococcus cultures by application upon obliquely coagulated agar, to which human blood serum had been added. Ghon and Schlagenhaufer avoid the complicated plate method entirely, by placing the clap pus (obtained from the urethra after cleansing and disinfection of the orifice) directly upon Pfeiffer's agar (*i.e.*, glycerin agar, whose surface has been thinly smeared with human blood taken from the lobe of the ear) or upon Petri's cups filled in a simi-

lar manner. The same tip is employed for the application of several cultures, and dilutions are thus made so that isolation of the gonococcus cultures is possible in case of soiling. Very beautiful pure cultures are also furnished in Peter's cups, spread with cow's blood-serum-peptone agar, and inoculated in the same way. A typical positive result was obtained in eight inoculations of the male urethra which Ghon and I made, for therapeutic purposes, upon different individuals, some of whom were already suffering from chronic blenorrhœa. The appearance of the cultnres, their behavior under Gramm's method, corresponded entirely to the descriptions of Bumm and Wertheim.

If we make a *résumé* of the investigations just referred to, the following facts may be regarded as well established:

1. The gonococcus is found in all cases of suppuration of the mucous membranes, especially of the genitalia and conjunctiva, which are described clinically as gonorrhœal.

2. It is absent in all non-gonorrhœal processes.

3. Pus free from gonococci does not produce gonorrhœa (Zweifel, Welander).

4. Pus containing gonococci produces gonorrhœa (Welander).

5. The micro-organisms which are cultivated from gonorrhœal pus, but which are not identical with the gonococcus, do not produce gonorrhœa (Sternberg, Lundsohem, Chameron).

6. The gonococci cultivated from gonorrhœal pus produce gonorrhœa, with distinct increase of the inoculated micro-organisms (Bumm, Aufuso, Wertheim, Ghon, Schlagenhaufer, and I).

Thus the etiology of gonorrhœa is well established, its virulence and virus are proven. We shall discuss the occurrence and diagnostic significance of the gonococcus in the special part.

CHAPTER I.

BLENORRHŒA IN THE MALE AND ITS COMPLICATIONS.

URETHRAL BLENORRHŒA.

Anatomical and Physiological Remarks.

Blenorrhœa of the male urethra is probably the most frequent disease with which the practical physician has to deal. With it he usually begins his early practice, and until the end it causes him many anxious hours. Frequent as is the disease, it is equally ungrateful as regards a positive and radical cure. The practitioner is often told by his patients, either openly or by intimation, that he cannot even cure a clap, and the specialist often hears the same thing from his practising colleagues. A part of the blame attaches to the patient and to our social conditions, which render it impossible for the most honest and conscientious patient to follow all the medical directions without compromising himself, unless he were to undertake "a trip South for the restoration of his impaired health." But the physician is in great part to blame. We venture to assert boldly that there is no department of general medicine in which such unscientific and routine treatment is adopted as in the case of blenorrhœa. A clap syringe of tin, hard rubber or glass, a collection of thirty to forty recipes for injections, are the entire armament of the large majority of physicians. Certainty of diagnosis by examination of the pus and urine, the methods of physical examination of the urethra, are usually *terra incognita* in the pathology and treatment of gonorrhœa. No wonder, then, that this so frequent disease is a true *crux medicorum* and forms the *"partie honteuse"* of general medicine.

It is only within the last ten years that some light has been

shed upon this darkness. Our long-known anatomical and physiological data began to be made available in the pathology of urethritis; diagnosis and localization were thus placed upon a positive basis, and the indications for treatment were shown more clearly.

The more recent diagnosis, pathology, and treatment of urethritis are based on an anatomical, physiological, and bacteriological foundation.

It is not my purpose to write a detailed anatomical and physiological treatise. I shall content myself with presenting those points in the anatomy and physiology of the urethra and bladder which constitute the immediate basis of our diagnostic and therapeutic action.

The question of the width, diameter, and dilatability of the urethra is an important one. It is a generally recognized fact that the calibre of the urethra is not uniform but subject to variations. These are visible when the urethra is merely slit up. If a perfectly normal urethra is slit lengthwise (Fig. 1), we find, on beginning at the orifice, immediately behind the latter, a dilatation, the fossa navicularis, *a*, behind this the urethra is somewhat narrowed and passes through the greater part of the pars cavernosa with tolerably uniform calibre, *b*.

At its posterior extremity begins a spindle-shaped dilatation, the bulb, *c*. Posteriorly this terminates quite abruptly, where the urethra enters the isthmus, and, during its passage through the diaphragma urogenitale, the urethra, which here bears the name pars membranacea, *d*, has a tolerably uniform size. Immediately after the exit from the diaphragm, *i.e.*, at the entrance into the prostate, the calibre of the canal again increases and it forms a spindle-shaped dilatation, *e*, which attains its greatest width at the caput gallinaginis, and, when the bladder is empty, again becomes somewhat narrower towards the entrance to the bladder.

A mould of the urethra therefore consists of several parts; 1, the fossa navicularis, a spindle which is broken off anteriorly; 2, pars cavernosa, which is uniformly tubular; 3, the bulb, a spindle which is broken off posteriorly; 4, pars membranacea, a short tube; 5, pars prostatica, a symmetrical spindle.

Of all these parts the orifice of the urethra is the narrowest; its width is given at 8 millimeters (24 of Charrière's

scale), but it is often narrower. Under normal conditions, a sound which has passed the orifice will always pass through the remainder of the urethra without obstruction. But if the orifice is wider, as sometimes happens, or if it has been dilated, as is sometimes necessary in operative procedures, we can convince ourselves that a much larger size may pass through the remainder of the urethra without hindrance; *the dilatability of the remainder of the urethra is much greater than that of the orifice.* This dilatability is not uniform, but differs in different parts. The pars membranacea comes next to the orifice, then the pars pendula, then the pars prostatica; finally the bulb, the widest and most dilatable. We usually speak of the calibre of the urethra as distinguished from its dilatability, but this is not correct. The urethra, whose walls, as can be seen with the endoscope, touch at a point or slit, possesses no calibre or only a minimum one. The passage of the smallest instrument through the urethra is only possible by the stretching of the walls, by their yielding to the pressure of the instrument. This is also true of the stream of urine which stretches the mucous membrane owing to the pressure of the contracting bladder. Hence the stream, when the bladder is paretic, is not alone feeble but also narrow, so that

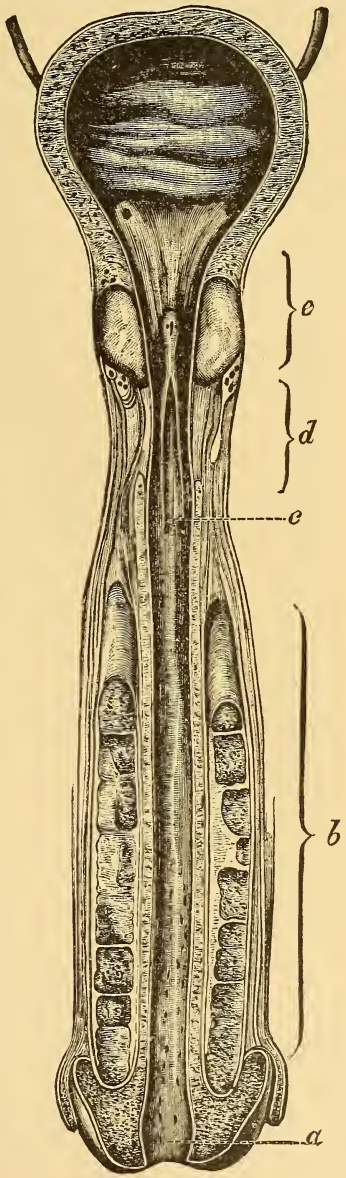


Fig. 1.

it may simulate a stricture. During normal micturition the walls of the urethra are never stretched to the maximum, as can be easily demonstrated. If the external orifice is suddenly closed during micturition, further distention of the urethra will follow.

Fig. 2.

Fig. 3.

While the meatus as far as the fossa navicularis is dilated only to a slight extent, the remainder of the mucous membrane is much more dilatable. As the result of changes in the walls—chronic hyperplasia of the connective tissue and cicatrices—which diminish the elasticity, this dilatability may be more or less diminished in circumscribed spots. In order to measure the width of the various parts of the urethra in cases of narrow meatus and without dividing the latter, Otis and Weir devised the so-called urethrometers (Figs. 2 and 3). These consist of straight catheters which open at the visceral end either in a hemisphere or spindle, and are covered with a rubber cap in order to prevent pinching of the mucous membrane. A screw at the outer end effects the dilatation of the hemispheres or spindle and indicates the diameter of the latter in numbers of the Charrière scale by means of a hand upon a dial plate. If such an urethrometer is introduced closed into the urethra—and this is done without difficulty by one who is expert in the introduction of straight instruments into the canal—we are able, in the pars prostatica (as I have convinced myself in numerous examinations), to dilate the hemisphere or spindle to 40 or 45 of the Charrière scale, *i.e.*, to a diameter of 12 to 15 millimetres, without feeling any resistance or causing an expression of pain on the part of the patient. But resistance is experienced at once if an attempt is made to withdraw the dilated instrument and the pars membranacea is approached.

Here the instrument must be screwed down to 27 or even 26 in order to pass without obstruction. At the bulb it again becomes possible to dilate to 40 to 50 Charrière. The pars cavernosa usually admits the passage of 30 to 35, and the orifice is only permeable to 24.

Rollet (1862) gives the following measurements for the different parts of the slit male urethra in the dead body:

Orifice	7 to 8 mm.	21 to 24 Charrière.
Fossa navicularis . .	10 " 11 "	30 " 33 "
Immediately behind the latter .	9 "	27 "
Middle of pars cavernosa . .	10 "	30 "
Bulb	12 "	36 "
Pars membranacea (middle), .	9 "	27 "
Pars prostatica (beginning), .	10 "	30 "
" " (middle), . .	15 "	45 "
" " (end), . .	11 "	33 "

The importance of the calibre and dilatability of the various portions of the urethra will receive special attention in the section on diagnosis.

A second question which interests us deeply concerns the muscular apparatus of the urethra and bladder.

The urethra is usually divided into a pars pendula, bulbosa, membranacea and prostatica, but this division has only a secondary importance for us. The division of the urethra into an anterior urethra—up to the isthmus—and a posterior urethra—behind the isthmus—possesses great diagnostic and therapeutic significance. This division is not arbitrary, but has an anatomical, developmental and functional basis. Anatomically, because the structure and surroundings of both parts are essentially different. The anterior part, which includes the pendulous and bulbous portions, is surrounded by erectile tissue, whence it is also called pars cavernosa. In the posterior part, the erectile tissue becomes insignificant and the most prominent feature is the abundant surrounding muscular layer, whence the term pars muscularis. Both portions of the urethra are also essentially different from a developmental point of view. According to Picard (1885) the urogenital sinus forms the entire urethra in the female, and only the posterior urethra in the male. The formation of the anterior urethra is en-

tirely independent. This develops from a nodule (phallus) which springs from the anterior wall of the cloaca, grows, and receives a groove on its lower surface, which closes in to form the anterior urethra. Finally, there is a functional difference between both parts of the urethra, inasmuch as the posterior part with its muscular layer forms an integral part of the uropœtic system, while the anterior urethra plays only a passive part in micturition, but, on the other hand, forms with its corpora cavernosa an essential portion of the sexual apparatus, and serves as the organ of copulation.

To what extent this division is justified in the pathology of blenorrhœa will be discussed in the appropriate chapters.

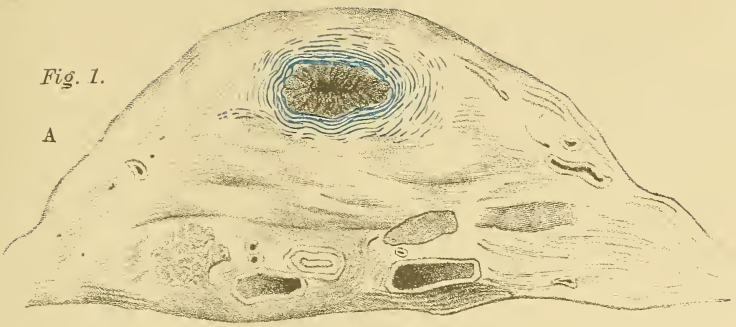
The quite simple anatomical structure of the pars cavernosa does not require our attention, but we must consider in detail the pars posterior seu musculosa.

We will first study its posterior portion, the pars prostatica. This owes its name to the surrounding prostate, an organ which is usually described as a gland, but possesses a much more complex structure. The investigations of the older anatomists, but particularly those of Henle (1863) and Langer (1885), showed that the inner surface of the prostate (which is directed towards the bladder) is formed by a sphincter composed of organic, smooth, muscular fibres, which is prismatic in shape, triangular on section and of very firm structure. It surrounds the urethra like a ring (Plate I, Fig. 1, A and B).

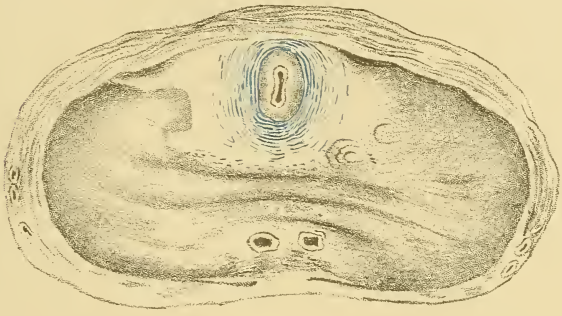
The smooth muscular tissue is mixed with numerous elastic fibres, and the network is made still denser from the fact that smooth muscular fibres as well as elastic fibres, which come from the bladder, cross these circular bundles. This smooth annular muscle is called the internal sphincter of the bladder, but preferably the internal prostatic sphincter. To the outside of this sphincter, *i.e.*, at the middle of the pars prostatica, the glandular portion of the prostate increases. It forms an acinous gland which, in well-developed cases, has the shape of a seal ring whose broad plate occupies the lower surface of the urethra, which is directed towards the rectum, while the narrow ring-shaped portion surrounds the urethra. The prostatic gland is rarely so fully developed; the upper portion, inclosing the urethra, is not quite complete, and the prostate then surrounds the urethra below and on the sides in the shape of a half-ring, which grows smaller above, but leaves the upper

Fig. 1.

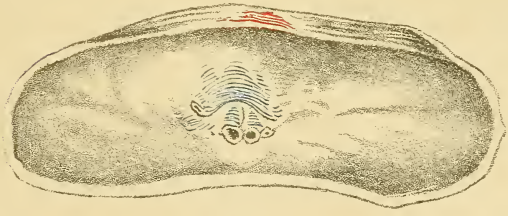
A



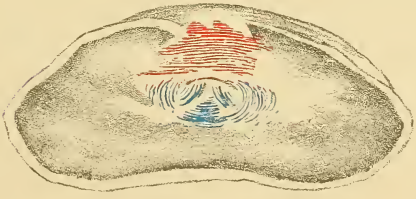
B



C



D



portion of the urethra free. This gland forms the boundary between the above-mentioned sphincter and a sphincter which, situated in front of the gland (the most anterior portion of the pars prostatica), occupies the apex of the prostate. Unlike the internal sphincter, this muscle—the external vesical or prostatic sphincter—is formed only in part of smooth muscle, but in great part of voluntary muscular fibres. The smooth fibres form a ring or network immediately in front of the gland. The voluntary fibres at first appear only at the upper end of the urethra (Plate I, Fig. 1, C and D), and are in direct apposition to the gland or, as this is often absent, to the fibres of the internal sphincter. These fibres cross the urethra and form a muscular layer which passes transversely over the urethra, from one lobe to the other. Contraction of these fibres would approximate one lobe of the prostate to the other, but as this gland is very firm and but slightly flexible, the lobes form fixed points, and the arched muscle between them, in shortening, loses its curve, and becomes straight, and thus compresses the urethra from above downwards. These muscular fibres form what Krause and Kohlrausch call the transverse urethral muscle. To these fibres are soon added others, which surround the urethra laterally and below (Plate I, Fig. 1, E), and when the urethra leaves the apex of the prostate, it is entirely surrounded by a complete sphincter of voluntary muscle (Plate I, Fig. 1, F). This muscle, which is composed of smooth and voluntary muscular fibres, we call the external vesical or prostatic sphincter.

As soon as the urethra leaves the apex of the prostate it enters the urogenital diaphragm, which it leaves again at the isthmus, and within which it is known as the pars membranacea. Despite its title of pars nuda it is surrounded by a broad layer of smooth and voluntary muscular fibres. This muscular layer has received the most diverse descriptions and consideration at various times. Observed by Winslow and Santorini, Wilson (1821) was the first to study it in detail. Guthrie (1836), Mercier (1845), Demarquay (1849) give different descriptions, nor are concordant opinions found among the German anatomists Meckel, Mueller, Arnold, Krause and Kohlrausch, Hyrtl, Henle, Luschka, down to Lesshaft (1873). But the great abundance of muscular tissue in the pars membranacea is evident from all the investigations, however

much they may vary in details. All accounts agree that it is covered by a broad layer of smooth muscular fibres, which consist of an inner layer of longitudinal, an outer layer of circular fibres. Henle (1863) puts the thickness of the longitudinal layer at 0.3 mm., of the circular layer at 0.75 mm.; Robin and Cadiat (1874) give 0.5 to 0.8 mm. for the former, 1.0 mm. for the latter. Outside of this is a broad layer of voluntary muscular fibres, whose individual strands surround the urethra like a ring internally, while the outer fibres pass above and below the transverse urethral muscle from one side to the other; finally, other fibres, which come from the deep transverse muscle of the perineum, surround the urethra like a loop. This muscular apparatus is termed the musculus compressor partis membranacea, or, in brief, the compressor urethræ.

It is evident from the statements just made that the prostatic and membranous parts are usually in a condition of tonic contraction. This contraction is produced by the tonus of the smooth muscular fibres surrounding these parts, and can also be made visible very clearly through the endoscope. If this instrument is inserted into the most posterior portion of the urethra, up to the bladder, and is then gradually withdrawn while the appearance of the mucous membrane is being watched, we will see that the mucous membrane (which forms a funnel, starting from the visceral edge of the endoscope and with its tip directed towards the bladder) is continually closing up pari passu with the slow withdrawal of the endoscope, and leaves only a punctate lumen. This tonic contraction of the mucous membrane subsides during micturition by reflex action, but it can be markedly increased by innervation of the transversely striated muscular fibres which are accessible to the will.

Both posterior portions of the urethra are accordingly closed against the bladder, and their muscular tonus alone, which may be further increased by voluntary impulse, will suffice to prevent the escape of urine from the bladder.

Let us now consider the muscular structure of the bladder. Its three layers of smooth muscular fibres,—an inner layer of circular fibres, a middle layer of meshed fibres, and an outer layer of radially distributed fibres—will always produce diminution in the size of the bladder during contraction, and thus

act as a detrusor. Has the bladder a special sphincter, and can it retain the urine independently without the intervention of the urethral muscular tissue? Anatomists have been occupied with this question for a long time. The attempt was made to construct such a sphincter of the bladder or to explain the closure of the organ in another way. Thus, Guthrie (1836) states that he could find neither circular nor spinal fibres at the neck of the bladder, and he is therefore of the opinion that the vesical neck possesses little muscular contractility but marked elasticity. Civiale (1850) declares that the question of the existence of a sphincter at the neck of the bladder is the most obscure point in the anatomy of the organ. Anatomists express divergent views. Some assume the existence of a sphincter, but only by induction; others regard the ring at the neck as a mechanical obstruction. Civiale himself found circular fibres very inconstantly and sparely in this ring, and regards the main feature as a labyrinth of longitudinal and spiral fibres passing to the prostate. Barkow (1858) locates the occlusion of the bladder in the annulus elasticus cervicis, but, like the writer just mentioned, believes that the main occlusion of the bladder is formed by the muscular tissue of the pars prostatica and membranacea. Henle (1863) acknowledges the existence of a thin bundle of smooth muscular fibres at the neck of the bladder, but does not regard it as a sphincter; its contraction can have no other effect than to narrow the lower part of the bladder and to aid in the complete evacuation of the urine. Henle also places the real sphincter of the bladder in the prostate. Wittich (1859) also accepts this view. Budge (1872) investigated the subject experimentally. He exposed the ureters in dogs and injected water through them into the bladder under such a pressure that it escaped through the urethra. This escape through the urethra ceased at once when Budge stimulated the muscular fibres of the pars prostatica and membranacea by means of electricity. If the urethra was divided immediately behind the prostate and the ostium vesicale stimulated, the escape of water was not checked. Dittel (1872) contradicted Budge's statements in view of experiments conducted by Stricker and himself, but the contradiction is merely apparent. Budge divided the urethra from the bladder "immediately behind the prostate," *i.e.*, together with the internal sphincter which belongs to the

prostate. He then found that electrical irritation of the vesical orifice did not prevent the flow of urine. Dittel divided the prostate in its posterior third about two lines in front of the internal sphincter, and then found that the outflow of urine was inhibited by stimulation of the vesical orifice and of the adjacent internal sphincter. He concludes, therefore, that the internal sphincter may prevent the evacuation of the bladder up to a certain pressure, a fact which was not denied by Budge. The internal sphincter belongs anatomically to the prostate, *i.e.*, to the urethra. Hence, the bladder possesses no special sphincter, the escape of urine is prevented solely by the contraction of the urethral muscular tissue. The bladder is not closed against the urethra, it has no power of preventing the entrance of solids or fluids which have passed the urethral sphincters or are pressed by the latter against the bladder. This fact is very important in regard to the diagnosis and pathology of urethral gonorrhœa.

When empty, the bladder, on account of the tonus of its muscular tissue, forms a tensely contracted sphere whose mucous membrane is everywhere in contact, so that it possesses no lumen or a very slight one. The pars prostatica also possesses no lumen on account of the tonus of its smooth muscular fibres. The bladder hangs upon the pars prostatica as upon a pedicle; there is a sharp boundary between the bladder and urethra. This configuration is not changed when the bladder begins to fill with urine (Plate II. Fig. 2). The pars prostatica remains closed, the bladder dilates and becomes more and more spherical, in proportion as the urine enters, an equilibrium being maintained between the pressure of the fluid within the organ and the tonic pressure of the muscular layer which is striving to contract. The fluid, being subject to this general tonic pressure of the muscular coat, is pressed against the orifice of the urethra, but this pressure can yet be overcome by the tonus of the internal prostatic sphincter and that of the elastic ring at the ostium vesicale. But as the distention of the bladder increases the pressure exerted by the fluid upon the ostium vesicale also increases, and finally becomes so considerable that it first overcomes the elasticity of the ostium and then the tonus of the internal prostatic sphincter, dilates the latter, and the fluid then begins to enter the posterior part of the pars prostatica. The hitherto sharp

E

F

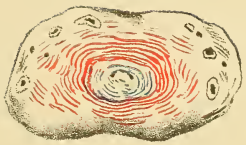


Fig. 2.

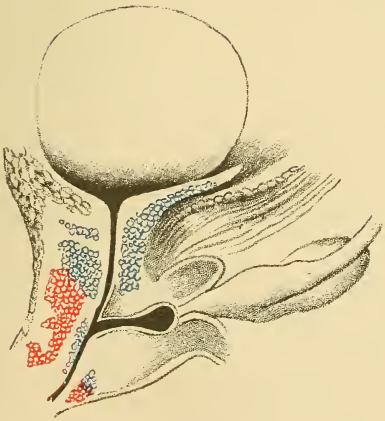


Fig. 3.

boundary between the bladder and urethra is abolished at this moment, the transition because a gradual one, and a "neck of the bladder" is formed.

The moment of entrance of the first drops of urine into the pars prostatica is also the time at which we feel the first desire to urinate. This desire is called forth by the irritation exercised by the urine upon the mucous membrane of the pars prostatica. There is absolutely no reason to believe that this desire can be stimulated from any point of the bladder, nor is this assumption justified by examination of the wall of the bladder with sounds and electricity, nor by our experience with patients, especially those suffering from calculi. All physiological and clinical experience shows that the pars prostatica, when irritated in any way, gives rise to the desire to urinate. Thus we know that this desire is violently produced during the introduction of bougies into the urethra as soon as they pass through the prostatic portion. All diseases of the prostate are accompanied by the most distressing vesical tenesmus. Examination of the prostate per anum and pressure upon it, even when normal, causes the feeling of a desire to urinate. Injection of a few drops of a solution of nitrate of silver, touching and cauterization of the pars prostatica through the endoscope, always causes violent, often long-continued tenesmus.

The first desire to urinate, which is caused by the stimulus of the entrance of the first few drops of urine into the prostatic portion, can be overcome voluntarily by innervating the transversely striated muscular fibres of the external vesical sphincter and compressor. As the feeling intensifies with the increase in the amount of urine, it can only be overcome by the action of the entire perineal muscular layer, and the urethra as well as rectum become closed spasmodically. This is the reason that when there is violent rectal tenesmus, micturition alone is impossible, because every attempt to relax the sphincter vesicæ externus and compressor also gives rise to relaxation of the anal sphincters.

The urine which now collects will no longer remain in the bladder alone but will also accumulate in the pars prostatica, which takes a share in the enlargement, and the bladder assumes a pyriform shape more and more (Plate II, Fig. 3). The pressure of the fluid in the bladder will increase with the

amount of fluid, and the increasing irritation experienced by the pars prostatica increases the desire to micturate.

On account of this inclusion of the pars prostatica in the bladder the urethra is considerably shorter when the bladder is full than when it is empty, a fact which I have demonstrated experimentally. If, in an individual who as yet experiences no desire to urinate, an elastic catheter is introduced into the urethra until the first drops of urine begin to flow and then the length of the portion of the catheter situated within the urethra is measured; and if the same procedure is repeated in this individual when the bladder is full and the desire to micturate already present, it will always be found that in the latter case the catheter need be inserted 2 to 3 cm. less deeply before the urine begins to flow—in other words, the urethra is so much shorter when the bladder is full. Repeated experiments, which I performed, as a matter of course, upon healthy individuals, showed that the length of the portion of the catheter within the urethra when the bladder was moderately full and the desire to urinate absent was 18 to 21 cm., when the bladder was very full and the desire to urinate pronounced, the length was only 16 to 19 cm. While, therefore, the internal prostatic sphincter closes the bladder when the latter is empty or only moderately full, this function is performed by the external prostatic sphincter and compressor partis membranaceæ when the organ is full.

The fact that the internal sphincter does not constantly close the bladder, but only when it is empty or moderately full, and that it is unable to resist the pressure of the contents of the bladder when the latter is full, and that the external sphincter and compressor then assume the function of closing the bladder, has been emphasized by various writers. Hyrtl said, in discussing micturition: "With this increase in the tension of the detrusor, the moment arrives at which its force is equal to that of the sphincter. Before this time arrives, the organism is unconscious of the desire to urinate. It is only when there is an equilibrium between the detrusor and sphincter, that the gravity of the urine comes into play. Its beginning entrance into the urethra then calls into play the contraction of the compressor urethræ, which compresses the membranous portion. Then the latter alone retains the urine by the compression of the sides of the urethra."

The same opinion is also maintained by Antal (1888) and Ultzmann (1880). The latter quotes the following description by Esmarch: "After a sufficient amount of urine has accumulated in the bladder and the latter is distended, this distention exercises an irritation upon the peripheral ends of the sensory nerves of the viscus. The latter pass through the spinal cord to the brain, where they produce the sensation of "full bladder." If the bladder is still further distended, reflex contractions of the detrusor are excited. The contracting detrusor gradually overcomes the internal sphincter and some urine then enters the neck of the bladder. As soon as the urine has entered the neck of the bladder, the external sphincter and the compressor urethræ contract, partly in a reflex manner, partly voluntarily, and prevent the further advance of the urine. At this moment arises the feeling of the desire to urinate. If the external sphincter is then relaxed by the will, the urine escapes in a full stream." Born (1887) examined the question experimentally. He injected plaster of Paris through the ureter into the empty bladder and allowed it to set, in animals and in corpses during *rigor mortis*. If only a little was injected and under slight pressure, the internal sphincter remained closed and the plaster cast of the bladder was ovoid. If more was injected and under greater pressure, the plaster extended into the prostatic portion, which was occluded by the external sphincter. The cast of the bladder was then pear-shaped, the tip corresponding to the dilated pars prostatica, which was included in the bladder.

By experiments on curarized animals, M. v. Zeissl (1892) proved that the detrusor and internal sphincter possess an antagonistic innervation, *i.e.*, irritation of the same nerve fibres causes contraction of the detrusor and relaxation of the sphincter, while irritation of other nerve fibres causes contraction of the sphincter and relaxation of the detrusor. If these conditions also obtain in man, the internal sphincter will be unable to offer any notable resistance to the detrusor, because irritation of the fibres which cause contraction of the detrusor will also open the internal sphincter.

We must be cautious, however, in the direct application of experiments on animals to the human subject. In the first place, the anatomical conditions of the two are different. For example, the dog possesses a strong sphincter in the prostate,

but the voluntary muscle which in man surrounds the membranous portion is wanting. In the dog the membranous portion is really a pars nuda.

This also corresponds to the fact that micturition is entirely different in man and animals. In the latter it is always involuntary, a purely reflex act.

In infancy, micturition is also a purely reflex act. In the child the closure of the bladder is effected only by the involuntary internal sphincter; the child has not yet learned to innervate the voluntary muscular fibres of the external sphincter and compressor, and employ them in closure of the bladder. It is only after education and practice that he learns to employ the voluntary muscles, so that gradually the unconscious reflex act is converted into the conscious voluntary act.

In view of all these statements three facts become evident:

1. The external sphincter materially exceeds the internal sphincter in power of resistance, inasmuch as it can resist the pressure of the urine to which the internal sphincter was compelled to yield.

2. With a full bladder, from the moment that the desire to urinate becomes noticeable, the urine collects not alone in the bladder, but also in the pars prostatica, and the bladder becomes more and more pyriform.

3. The pars prostatica contains nerve terminations which possess a specific sensibility and which convey the feeling of the desire to urinate; under physiological conditions, as the result of the pressure of the urine in the pars prostatica; under pathological conditions, as the result of various causes (mechanical, chemical, inflammatory).

The importance of these considerations in regard to the pathology of urethritis will be discussed at a later period.

The compressor partis membranaceæ presents still further interest.

In the first place it plays an essential *rôle* in the, in part, physiological phenomenon which is usually known as urethral spasm.

If, in a healthy individual with a healthy urethra, a sound corresponding to the calibre of the urethra, *i.e.*, about No. 24 Charrière, is introduced, the bulb can usually be reached without any obstruction, but on passing into the isthmus

urethræ, the pars membranacea, this is felt to contract in front of the instrument and to close tightly around it, and thus impedes the passage of the sound. The irritation which the sound exercises on the urethral mucous membrane causes a reflex contraction of the compressor partis membranaceæ. In nervous, irritable individuals this contraction may become really spasmodic and may make the further passage of the instrument impossible. We then speak of urethral spasm. Such a spasm may also occur when the mucous membrane of the urethra is in a condition of increased irritability as the result of inflammatory conditions, and in both cases the spasmodic contraction may be so violent that we are readily inclined to believe in the presence of a stricture. If smaller sounds are now introduced, their thinner and therefore more irritating tip will increase the spasm still more. This spasm may also be excited from behind, from the mucous membrane of the prostatic portion. This may happen in a perfectly healthy individual if, when the bladder was very full, he was compelled for a long time to overcome the desire to urinate and therefore to innervate the muscular fibres of the external prostatic sphincter and the compressor urethræ. When finally the moment for the possibility of micturition arrives, this does not occur promptly in many cases, at least in the beginning, and the urine is discharged in a thin, interrupted stream. The high pressure of the urine in the pars prostatica irritated the latter, and the irritation provoked reflex contraction of the sphincter apparatus, which only subsides pari passu with the diminution in the amount of urine and its pressure, *i.e.*, with the diminution in the intensity of the irritation exercised upon the mucous membrane of the pars prostatica.

Such a reflex spasm of the sphincters is naturally produced much more readily when the pars prostatica is in a condition of increased irritability as the result of inflammation. In severe inflammations the mere irritation of the stream of urine is sufficient to produce partial or complete contraction of the sphincters and thus narrowing of the stream of urine or retention, as is seen not infrequently in blenorrhagic processes.

In all these reflex spasms, whether produced by pathological or physiological processes, the compressor partis membranaceæ is mainly affected, and they therefore occur

particularly in the membranous portion of the urethra. In rare cases of extreme nervous or inflammatory irritability of the urethral mucous membrane, reflex contractions of smooth muscular fibres in the submucous tissue of the pars cavernosa, and therefore slight spasms may be produced. These interfere with the introduction of the sound or impede its advance.

Reflex spasms of the musculus compressor partis membranaceæ may be provoked, not alone by the irritation of a sound or bougie but also by the irritation and pressure of fluids. And thus we can usually succeed in injecting inert fluids into the urethra as far as the bulb, but their entrance into the membranous portion is prevented by the contraction of its muscular layer. This reflex contraction becomes more intense when the injected fluids are slightly irritant, such as astringents, and when the mucous membrane in question is in a condition of increased irritability as the result of inflammation. The contraction of the compressor partis membranaceæ is usually the cause of the fact that the fluids injected into the urethra for the treatment of acute urethritis enter as far as the bulb but not to the membranous and prostatic portions. Attention was called to this experience by Baumes (1840), Behrend (1848), Sigmund (1852), Diday (1859), Milton (1875), Guiard (1884), Bédoin (1886) and many others. Teleki (1891) demonstrated experimentally that, with the ordinary clap syringe, fluids injected into the urethra only reach the bulb, but do not enter the membranous and prostatic portions. In thirty-five cases he introduced powdered methyl blue, by means of the endoscope, into the membranous portion. He then injected water into the urethra with the clap syringe. The water escaped uncolored from the urethra, thus proving that it had not been in contact with the methyl blue. In a second series of experiments (twenty cases) he injected a concentrated solution of sugar into the urethra. The bulb and pendulous parts were then wiped clean through the endoscope and the individual allowed to micturate. The urine was always found to be free from sugar. From experiments on the dead body M. v. Zeissl maintained the possibility of injecting fluids into the bladder by means of the clap syringe, but it must be remembered that we have to deal with reflex processes which cannot be studied in the dead body. We should also remember the difficulty often experienced in

filling the bladder, during lithotripsy, by applying the syringe to the external meatus, despite profound narcosis of the patient. It is evident that the external sphincter will finally yield to forcible pressure, but this procedure is so violent that, with Desnos (1888) we must utter an urgent warning against its performance. In addition this requires a larger amount of fluid than is held by the ordinary syringe.

The musculus compressor partis membranaceæ, accordingly, divides the urethra into an interior open and a posterior closed portion. But in the same way that this muscle prevents the passage of fluid from the anterior into the posterior portion, it also prevents the escape of fluid from the posterior into the anterior part. If such fluids are to be discharged they do not pass externally through the anterior part, but pass backwards into the bladder. Thus, blood and pus flow from the pars posterior back into the bladder, as do the fluids which we inject into the pars posterior. Diday (1839) proved this in a very ingenious way. If, in a healthy individual, a catheter is introduced into the slightly filled bladder until the urine begins to flow, the eye of the catheter is situated at that moment in the most posterior portion of the pars prostatica in front of the internal prostatic sphincter. To the outer end of the catheter is now attached a syringe containing about ℥ j. of a lukewarm, perfectly bland fluid, and this fluid is slowly injected, the catheter being slowly withdrawn at the same time. We will then find that the fluid, which is thus injected into the pars prostatica, does not escape alongside the catheter (which we may purposely choose of small size, 16 to 18 Charrière) but passes into the bladder. So long as the eye of the catheter remains behind the compressor, all the fluid passes through the pars posterior into the bladder. On further withdrawal of the catheter the moment arrives in which it is difficult to inject any fluid at all. This happens when the eye of the catheter, in passing through the compressor, is closed by its spasmodic contraction; a moment later, when the eye of the slowly withdrawn catheter has passed the compressor and reached the bulb, the fluid begins to regurgitate alongside the instrument. With the aid of Guyon's "instillateur," an instrument with which we will become acquainted in the discussion on the treatment of urethritis, Jamin (1883) injected small amounts of fluid into

the pars anterior and posterior, and states that when only two to three drops of inert fluid were injected into the bulb they made their appearance at the orifice of the urethra, while he could inject even forty drops in the posterior part behind the compressor, without a single drop appearing at the orifice. In order to demonstrate the regurgitation of small amounts of fluid from the pars posterior into the bladder, Casper (1887) deposited a few drops of yellow ferro-kalium cyanate into the pars posterior and, at the end of a little while, directed the patient to urinate at three intervals. None of the salt escaped at the orifice of the urethra. If it had remained in the pars posterior the first portion of urine would have washed away the greater portion, the second portion would have contained only traces, and the third part would have been almost entirely free. Examinations of the urine with ferric chloride (Berlin blue reaction) showed the salt in all three portions of urine, but especially in the second and third portions, which, to judge from the change in color, contained almost equal amounts of the salt—a proof that a part, at least, must have passed into the bladder.

From all these data it is evident that the compressor muscle divides the urethra into two sharply defined portions, which we call the pars anterior and pars posterior, a division which possesses very material importance in the pathology, symptomatology and treatment of clap in the male.

CHAPTER II.

ACUTE URETHRITIS.

Infection.

We have learned that blenorrhœa is a virulent process whose virus is the gonococcus, and we therefore recognize only one condition as necessary to the production of blenorrhagic urethritis as of all blenorrhagic affections, *viz.*, the conveyance of gonococci in any vehicle, which usually, but not always, consists of the mucus or pus derived from another blenorrhagic affection.

Blenorrhagic urethritis can only develop by inoculation with gonococci. Its chief source is the transmission of blenorrhagic pus from the sexual organs of the female sex, and therefore coitus with a woman suffering from blenorrhœa of the sexual organs is the main source of blenorrhagic urethritis in the male. It is an evident *conditio sine qua non* that the woman from whom a man acquires blenorrhagic urethritis, must herself suffer from blenorrhœa. That this cannot always be proven on confrontation, results from the incomplete examination and from the fact that the disease is frequently latent and presents no symptoms in the female. This is especially true of chronic blenorrhœa. The fact that several men may acquire blenorrhœa from the same woman while others escape, that a man cohabits with a woman safely for a long time and then suddenly acquires blenorrhœa, although no changes have occurred in the woman, only proves that infection does not always take place, but that other conditions, favorable to infection, must be present. In their absence, or when conditions arise which antagonize infection, the latter will not take place. Blenorrhœa of the sexual organs in the female is therefore the most important source of blenorrhagic urethritis in the male, and coitus is the means of infection. Women who are more exposed to the acquisition of blenorrhœa

because they bestow their favors upon a number of men, are also more dangerous as regards the transmission of clap. According to Fournier's statistics (1866) infection was conveyed in 387 blenorrhœas in men by:

Prostitutes, public,	12
" private,	44
Mistresses, Actresses,	138
Working women,	126
Servants,	41
Married women,	26
	387

We see from these statistics that those women who are prostitutes without being under police control, do most towards the propagation of blenorrhœa, married women less, because they suffer less frequently, prostitutes little, because although they are often infected, the control and treatment rapidly make the infection harmless.

We have said that coitus is the chief agent in infection, but blenorrhœa can also be conveyed in other ways. For example, by unnatural sexual intercourse. Thus, Horand (1886) reports the following case: A medical student, previously perfectly healthy and never infected with blenorrhœa, had intercourse per os with a prostitute, but avoided other modes of sexual contact. A few days later pruritus of the orifice of the urethra was experienced, and a typical urethritis developed, in whose secretion numerous gonococci were demonstrated. Inasmuch as the genitalia as well as the buccal mucous membrane of the woman were found healthy on examination, Horand assumes that the gonococci were deposited in the girl's mouth during a previous coitus per os with a man suffering from blenorrhœa and were conveyed in this way. Langlebert, Clerc and Diday report similar cases.

Coitus per rectum may also convey blenorrhœa. Jullien (1886) relates that two friends had sacrificed to the same goddess. Orestes, who was to begin the sacrifice but knew himself to be unclean, would not, for the world, soil the sanctuary which Pylades was to enter after him. In order to avoid betraying either his secret or his friendship, he sacrificed to Venus Kallipygos. Pylades, who knew his friend's supposed

secret but was ignorant of his tender consideration, thought it was more prudent to deviate from the usual custom and sacrificed at the same altar as his friend. Orestes had long been consoled, while Pylades still shed abundant tears. Winslow (1886) reports an epidemic of urethral blenorrhœa which broke out in a boys' school. This was spread through pederasty, starting from an imported case of clap.

The manner in which the infection occurs was much discussed in former times. Wendt (1827) maintained that it occurred after ejaculation, by a sort of aspiratory activity of the urethra, and adduces in evidence the fact that some voluptuaries, who masturbated in lukewarm milk, had discharged from the urethra a few drops of milk just before the next micturition. Others assumed that the virus is absorbed by the glans, received in the urethra in the shape of a gas, sucked in before or after ejaculation, or that it only causes irritation externally. All these assumptions fall to the ground, since we know that direct transmission of the gonococci-containing vehicle is necessary to infection.

Whether contact of this vehicle with the orifice is sufficient for infection, or whether its entrance into the urethra, if only for a short distance, is necessary, must be left undecided. The latter seems more probable. But there are always certain factors which favor or interfere with the occurrence of infection. We know that not alone the transmission of the virus but also the suitable character of the soil is necessary in every infection. Even if the first condition is present, the receptivity of the soil may vary. In this regard one factor merits special consideration. A slightly alkaline soil seems especially adapted to the implantation and development of gonococci as of all other virulent micro-organisms. The mucous membrane of the urethra is always washed by an acid fluid on account of the urine which remains upon it. This amount would be sufficient to cause notable injury, during an ejaculation, to the semen, which is extremely sensitive to acids. But the urethra possesses special glands, which are particularly active during erection, and are designed to neutralize these acids. These glands are racemose and are situated in the meshwork of the corpora cavernosa. During erection this meshwork and the glands enclosed within it are subjected to the pressure resulting from the stasis of blood and distention of the corpus

cavernosum. This expresses from the numerous glands a clear, gelatinous, alkaline (not acid, as was stated by Sinéty and Henneguy, 1885) fluid, which covers the mucous membrane of the urethra, neutralizes the traces of acid, and may also escape from the urethra in the form of drops as *urorrhœa ex libidine.* This alkaline fluid also increases the receptivity for an invasion of gonococci, by making the soil alkaline, causing swelling of the epithelium, and facilitating the entrance of the germs. Hence infection is favored by everything that stimulates the secretion of this alkaline mucus. This includes protracted and repeated coitus and all factors which retard the occurrence of ejaculation, such as bodily strain or drunkenness. This is also true of coitus which has been preceded by long-continued sexual excitement and the attendant protracted erections, which are always accompanied by *urorrhœa ex libidine.* It is questionable whether infection is favored by a wide meatus or by the absence of ejaculation, which sweeps away the gonococci.

Among the factors which are unfavorable to infection must be mentioned, brief duration of coitus, the absence of repetition of the act, and micturition immediately after coitus. The latter rapidly acidulates the soil, and thus possibly removes the introduced gonococci from the membrane or even kills them.

To what extent stimulants, such as spicy food and drink, and cantharides, favor infection must be left undecided. At all events they may facilitate infection by causing protracted erections on account of the increase of sexual desire, and also by the stimulus to repeated and artificially prolonged coitus.

But the production of urethral blenorrhœa requires nothing more than the entrance of the gonococci in any vehicle into the urethra. And so a clap will result from the introduction of a gonococcus pure culture for purposes of experiment or in any other way, such as directly through the medium of articles of clothing, instruments, etc. We cannot deny the development of blenorrhœa in this way, although authentic cases of this kind are rare. Among the laity, however, there is a remarkable tendency to regard this mode of infection as frequent, and to accept the most impossible manner of infection rather than to accuse the mistress, or even a prostitute, of effecting the infection.

Symptomatology.

The entrance of gonococci into the meatus and perhaps also into the front part of the urethra causes an acute catarrhal inflammation of the mucous membrane with a typical course, which is known as acute urethral blenorrhœa or clap. How far does the disease extend along the canal? The older physicians did not think that the inflammation involved a large surface. For example, Swediaur (1798) believed that clap was located chiefly in the fossa navicularis, where it attacks the lacunæ of Morgagni, while all claps that are situated more deeply, at the curve of the penis, the veru montanum, neck of the bladder or bladder, resulted from improper treatment or some internal cause.

Later observers noticed that clap may extend further along the mucous membrane and may even attack the entire canal. Behrend (1848), the translator and commentator of Hunter, divided blenorrhœa into a blenorrhœa urethralis penis and blenorrhœa urethralis prostatica.

Even previous to this time Desruelles (1836) had gone further, and distinguished four kinds of blenorrhœa according to its location: 1, Clap of the most anterior portion; 2, clap of the pendulous portion; 3, clap of the bulb; 4, clap of the membranous portion. This classification, because artificial, found no support, and the opinion gradually gained ground that clap always extends along the entire urethra, from the external to the vesical orifice. Zeissl and Sigmund also advocated this view.

But this opinion did not remain unopposed. Langlebert (1864) claimed that clap is often confined to the cavernous portion of the urethra. Tarnowsky (1872) maintained that, in the majority of cases, the process does not extend beyond the boundaries of the bulbous portion. The same opinion was adopted by Mueller (1875). But it was especially Guyon (1883) and his pupil Jamin, who clearly proved the fact that acute typical urethritis is confined to the pars cavernosa, that the spread of the process to the pars posterior is an ominous complication, which does not belong to typical urethritis. This doctrine was developed on French soil by Aubert (1884), Erand (1885), Picard (1885), Bédoin (1886), Crivelli (1886), and transplanted to Germany by Ultzmann (1883), where it is com-

bated by only one opponent of note, *viz.*, Fuerbringer (1884). We have also become convinced that clap, in its typical course, extends to the bulb and no further. The extension of the inflammatory process to the pars posterior must be regarded as a complication, which produces deviations from the typical course, and may be the source of other serious sequelæ and complications, in other words, which change the symptomatology materially and aggravate its course.

The typical form, which extends only to the bulb, we call acute anterior urethritis, while the term acute posterior urethritis is used when the process extends to the pars posterior, and thus really over the entire mucous membrane, on account of the predominance of the symptoms which result from the affection of the posterior portion.

Acute Anterior Urethritis.

Acute anterior urethritis is a blenorrhagic inflammation, with a typical course, of the mucous membrane of the pars cavernosa and bulbosa urethræ. Beginning with slight symptoms after several days' incubation, the process gradually increases, at first in intensity, then in extent, and reaches its acme in both respects at the end of the second or beginning of the third week. It then diminishes gradually in intensity and extent in the same direction, *i.e.*, from before backwards, and terminates in five to six weeks.

Every blenorrhœa begins with a

Period of incubation, i.e., if an individual has been exposed to infection, the first symptoms do not occur immediately afterwards, but an appreciable interval of apparent perfect health, which is known as incubation, intervenes between infection and the first symptoms. This incubation is explained on the ground that the virus is conveyed in extremely small quantities, and in the beginning produces very slight symptoms which can neither be seen nor felt. But the virus animatum, having reached a favorable soil, increases rapidly, and the evidences of reaction increase in the same measure, until finally they reach the bounds of the visible. The incubation then ceases. The length of this period varies between quite considerable limits, and its determination is often made difficult by the uncertain and false (intentionally or otherwise) statements of the patient.

The following is the duration of incubation as shown by the statistics of 479 cases by Eisenmann (1830), Hacker (1850) and Hoelder (1851):

1 day in . .	11 cases	11 days in . .	6 cases
2 days in . .	59 "	12 " " . .	8 "
3 " " . .	126 "	13 " " . .	6 "
4 " " . .	62 "	14 " " . .	19 "
5 " " . .	49 "	19 " " . .	2 "
6 " " . .	10 "	20 " " . .	1 "
7 " " . .	63 "	30 " " . .	1 "
8 " " . .	12 "	Uncertain in . .	9 "
9 " " . .	12 "		479
10 " " . .	23 "		

Lanz's (1893) more recent statistics, which are important because the nature of the disease was proven in every case by the demonstration of the presence of gonococci, gives the following results:

1 day in . .	2 cases	8 days in . .	1 case
3 days in . .	15 "	10 " " . .	1 "
4 " " . .	4 "	14 " " . .	1 "
5 " " . .	9 "	20 " " . .	2 cases
7 " " . .	4 "		39

In Welander's (1886) cases of gonorrhœa, which were produced artificially by inoculation with pus containing gonococci, the period of incubation was two days. It also varied from two to three days in the inoculations of Bumm (1885), Anfuso (1891), Wertheim (1892), and our own.

The greatest number of cases develop, therefore, on the third day, more than two-thirds within the first week (380 out of 479); a period of incubation longer than fourteen days is extremely rare.

In truth, the duration of the period of incubation varies, as a rule, between three and five days. It is usually shortest after a first infection, and generally becomes somewhat longer after subsequent infections, but it rarely exceeds six or seven days.

Extremely short periods of incubation, such as twenty-four hours or less, are very suspicious. It is particularly sus-

picious as regards the question whether we have to deal, not with a fresh infection, but with a previous, apparently cured clap, which ran a latent course for a longer or shorter period and exacerbated on account of recent coitus, the exacerbation being regarded as a fresh infection.

Nor should statements concerning long periods of incubation be accepted without further inquiry. In such cases it usually happens that infection resulted from coitus performed a longer or shorter period before, and this was followed by subacute urethritis, which was overlooked by the inattentive patient. An excess in Baccho or some other noxious agent then brought the process to its complete acute development and this impressed the patient as the beginning of a fresh disease. It is also evident that the conduct of the patient in other respects will also influence the duration of incubation. Attention and sensitiveness on the one hand, recklessness, inattention and slight sensitiveness on the other hand, will cause the first morbid symptoms to be noticed sometimes earlier, sometimes later.

The period of incubation is important in so far as it draws a sharp line between virulent blenorrhœa of the urethra and all those catarrhs which, symptomatically like blenorrhœa, owe their development to mechanical and chemical influences and which develop immediately after such action, so that a period of incubation is absent. Thus, if a catheter or bougie is introduced into the urethra of a perfectly healthy individual and a sharply astringent or caustic injection is made, a purulent secretion, accompanied by inflammatory symptoms, will appear. Apart from the absence of gonococci this will be characterized by the fact that it begins at once or a few hours after the injection.

The transition from the period of incubation to the morbid process forms a longer or shorter

Prodromal Stage.—The patients experience a slight tickling or pricking at the orifice, both spontaneously and on urination, the orifice appears somewhat reddened and, if urine has not been passed for some time, the lips of the meatus are glued together, or a viscid, slightly grayish fluid appears between them in the shape of a small drop. In sensitive individuals slight general symptoms — depression, malaise, anorexia— occur at this time. These are probably of a psychical character, the result of a premonition of the things to come.

The prodromal symptoms are rapidly aggravated and pass into the

Florid Stage.—The mucous secretion at the orifice increases, but is gradually converted into a, at first, milky, then creamy pus. In a short time, usually at the end of the first week or beginning of the second week, thick green pus appears, and its amount soon becomes so considerable that it exudes day and night in the form of large, heavy drops, and soils the genitalia and clothing of the patient. The inflammatory phenomena, of which the suppuration is a symptom, increase to an equal degree. The meatus and surrounding parts are reddened, the course of the entire urethra in the pendulous portion is swollen and tender on pressure; lancinating pains occur spontaneously, but are especially violent during erections. The latter are particularly frequent at night and extremely distressing to the patient. This is also true not infrequently of pollutions. On account of the swelling of the urethral mucous membrane, the stream of urine becomes very narrow, divided and split up, and the passage of urine along the urethra is extremely painful and attended by more or less intense burning along the canal. All these symptoms increase until the end of the second week or beginning of the third week. At this time the inflammatory process has extended to the bulb. Pressure, and a feeling of warmth and fullness in the perineum, are added to the other symptoms, and their severity, together with the slight nocturnal rise of temperature and the insomnia due to the painful erections, reduce the patients, mentally and physically, not a little.

At this time—about the middle or end of the third week—the symptoms usually undergo a rapid change for the better in typical cases of acute anterior urethritis. The inflammatory phenomena and the subjective symptoms diminish, the secretion, although still profuse at first, becomes thinner and milky, later mucous, then diminishes in amount, and is reduced to a small amount of grayish mucus which glues together the lips of the meatus and is visible only in the morning. Finally, this disappears and the entire process may have undergone recovery by the fifth or sixth week after infection.

In severe cases deviations from the course just described may take place, inasmuch as, after the acme (third week) the inflammation spreads to the pars posterior, or after the terminal stage the process passes into a chronic stage.

In milder cases, especially under the favorable hygienic and dietetic conditions to which hospital patients are subjected, the process may be materially shortened without any other than, at the most, antiphlogistic treatment, because the process does not occupy its entire territory, but is confined to a portion of the pars pendula, and without attaining its full development is completely cured in two to three weeks.

Even when the course is perfectly typical the intensity of the process varies extremely in different cases. Moderate suppuration, mild subjective symptoms consisting of slight burning during micturition and slight pain on erection,—and abundant, even sanguino-purulent secretion, almost constant pains, increasing very considerably on urination and erection, and not inconsiderable general symptoms, are the extremes. As a rule, the first infection is the most intense, later ones are milder; they rival the first attack in severity only when occurring at intervals of several years. As a matter of course the virulence of the conveyed secretion plays a part which should not be underestimated.

We will now consider the individual symptoms somewhat more in detail.

Inflammatory Symptoms.—If we examine the patient's genitals we will find, in mild cases, merely a slight redness of the orifice and the surrounding parts. The mucous membrane of the meatus is somewhat everted, as the result of the swelling, reddened, and covered with crusts of dried pus. In the severer cases the swelling is more pronounced, and is not confined to the vicinity of the orifice; the entire glans penis is swollen, reddened and in a condition of semi-erection. The ectropion of the mucous membrane is more marked, and the latter is excoriated and bleeds readily. The prepuce is œdematous, but has the normal color; or it may also be reddened, and the redness and swelling then extend more or less to the integument of the penis. Beneath the skin we not infrequently see and feel one or more strands, partly cylindrical, partly spindle-shaped, which may attain the thickness of the little finger. These are painful on palpation and may be traced to the symphysis. The integument over them may be still movable, but it is often adherent to the strands, especially when it is also reddened and œdematous. These strands, which often take their origin from the frenulum, pass around the coronary

sulcus in an arch and unite in the median line of the dorsum, are inflamed lymphatics (acute lymphangioitis). This affection, although very painful—it is attended by painful tension, particularly during erection—is a relatively harmless and insignificant complication which usually undergoes rapid resolution.

The urethra is more or less swollen along its entire course, and pressure upon it is painful, particularly in the region of of the fossa navicularis. Along the course of the urethra we often feel more or less numerous nodules as large as a millet seed, the swollen Littré's glands, which, in very acute cases, are often arranged in rows like a rosary.

After expressing the pus from the pendulous urethra and cleansing the lips of the meatus, some gonococcus-containing pus may sometimes be squeezed out of openings, as large as the prick of a pin, on the inside of the lips of the meatus. The blenorrhœa has then extended into the mucous glands or blind crypts of the urethra, which are situated in the lips of the orifice. Diday (1860) first called attention to this para-urethral blenorrhœa, which has been recently studied anew by Jadassohn (1890).

The same condition is found in hypospadias, in which the pus often escapes not alone from the underlying urethra, but also from the two or three blind crypts of the covering of the glans; it may also be squeezed out of two para-urethral canals which are situated to the right and left of the orifice.

Similar blind crypts are found in the coronary sulcus at the præputial margin. I have demonstrated anatomically that the so-called Tyson's glands are also crypts and not true glands. These crypts may also be the site of blenorrhagic inflammation, as has been shown by Toulon (1889), Pick (1889), and Jadassohn (1890). Very obstinate, hard, inflamed nodules are then produced; they suppurate from time to time and then close up. The pus contains gonococci. Toulon (1889) calls this affection external urethritis, and demonstrated the proliferation of gonococci between the pavement epithelium cells, which Bumm regarded as immune. I have repeatedly observed the external urethritis described by Jadassohn—inflammatory strands alongside the raphe of the penis, which usually contain several small fistulous openings. In one of my cases such an inflamed strand extended to the penoscrotal angle. Punc-

tate openings formed in various places and discharged pus which contained gonococci. An injection, with the hypodermic syringe, of weak solutions of corrosive sublimate and carbolic acid showed that the fistulous openings communicated with one another. Recovery only ensued after slitting the fistulous canals, which are permeable to fine sounds. I recently observed a unique case of blenorrhagic infection of a canal situated alongside the meatus, without blenorrhagic infection of the urethra.

Secretion.—This is the most constant, often almost the sole symptom of blenorrhœa. It varies according to the stage of the process, and the abundance and purulence of the secretion are the most important gauge of its intensity.

The secretion is muco-purulent. Its abundance is proportionate not alone to the intensity but also to the extent of the process. Slight at the onset, the amount increases from day to day, reaches its maximum with the acme of the inflammatory process or somewhat later, and then gradually diminishes. It is often very considerable at the height of the disease. When the patient stands before us stripped, the pus not infrequently wells out in drops from the urethra. The amount of secretion varies not alone according to the stage of the disease, but also according to the time of day. Most patients notice that the secretion is greatest in the morning, diminishes towards noon and is least at night; it then increases again until morning. These variations in the accumulated amount of secretion depend in part upon the time allowed for its accumulation. It will depend evidently on the intervals in which the urethra is cleansed of secretion by urination. The fact that the patients generally urinate either not at all or only once during the night is brought into causal relation with the fact that the morning secretion is the most considerable. This relation is undeniable, but it is not the only cause of the increased morning secretion. Accurate observations have shown that in the course of every acute clap nocturnal exacerbations and diurnal remissions alternate periodically. The amount of pus found in the morning is always considerable, even if the patients micturate between three and four o'clock and thus discharge the pus. If they retain the urine five or six hours during the day, the accumulation of pus is never as great as in the morning. The inflammatory symptoms are also aggravated at night. Patients who are constantly in

bed, as in the hospital, may sleep quietly for several hours during the day, without being annoyed by erections, but they are hardly asleep at night before they are awakened by an erection.

But these exacerbations and remissions are not so distinct in patients who remain permanently in bed. For this reason I believe that the nocturnal exacerbation is due in part, though not entirely, to the noxious influences of the day.

The amount of secretion may be gauged from that which escapes from the meatus, but accurate data concerning the quantity and nature of the secretion are also furnished by examination of the urine, which presents essentially different appearances in the different stages of the disease.

We will first emphasize, from a diagnostic stand-point, the fact that in acute anterior urethritis the production of pus takes place in the pars pendula and bulbosa. If the pus is produced in large quantity it will escape from the orifice of the urethra, and its passage from the bulb into the pars posterior is impossible. If a patient who is suffering from anterior urethritis passes urine, the pus accumulated in the urethra will be swept away by the first stream, which thus becomes cloudy. The urine passed subsequently finds the urethra free from secretion and therefore remains clear. If we perform Thompson's test with the two glasses, *i.e.*, direct the patient to pass the urine in two parts into two beakers, the first urine passed alone will contain secretion, the urine in the second glass will remain clear.

The nature and amount of this secretion are shown much more clearly by examination of the first urine passed than by looking at the secretion as it wells up from the urethra. In the prodromal stage the secretion is slight and mucous; it is rolled together by the urine, in which it appears in the shape of fine or coarse threads, clap threads. The amount of secretion gradually increases and becomes more purulent, its color grows milky. The urine is then more or less cloudy, and if allowed to stand, two layers are seen at the bottom of the vessel. The lower one is a narrow, firmer layer of pus composed of small, yellowish-white clumps; the upper layer is a broader, looser, grayish layer of mucus, above which the urine itself looks clear. The more purulent the secretion, the more the width of the mucous layer diminishes and that of the

purulent layer increases, and in the purulent stage, at a time when the abundant secretion is deep yellow or even greenish yellow, the sediment, which is usually deposited rapidly, is only purulent. As the process improves the purulent secretion becomes muco-purulent, then mucous, and diminishes in quantity; in the mucous terminal stage we find only a few shreds of mucus and pus in otherwise clear urine.

Microscopical examination of the secretion furnishes interesting data concerning the morphological constituents and the presence of gonococci.

In the beginning the mucous secretion of the prodromal stage or the shreds collected from the urine contain (Plate III., Fig. 5) chiefly large, rhombic pavement epithelium and only a few pus cells. The gonococci, which are usually present in no small numbers, are in great part free, in part are situated upon or more rarely within the epithelial cells, and also within the pus corpuscles.

In the stage of muco-purulent secretion, the number of gonococci first increases, then the pus corpuscles; many pus cells are more or less filled with gonococci. Free masses of the cocci are rare, and when present they can usually be distinctly recognized as derived from the destruction of pus cells which had been filled with the organisms. Pavement-epithelium cells are scanty and usually more or less covered with gonococci. Oval, polygonal and cuboid, uninuclear transitional epithelium, also partly covered with gonococci, are more numerous.

At the height of the process (Plate III., Fig. 6) all other cellular constituents diminish in comparison with the pus cells, which are present in large numbers and dominate the field. The number of gonococci also seems smaller, although there are still a large number of gonococci-containing pus cells. I do not think that the number of gonococci diminishes at this stage, but the relatively more rapid production of pus corpuscles makes their number appear smaller. Podres (1885) states that in one series of cases, at this stage, he found all the gonococci in pus cells and very few free ones, in a second series of cases the majority of the gonococci were free. The first series ran a mild, the second a severe course. In the numerous examinations which I have made, I have been unable to confirm these statements, especially their prognostic significance.

In the terminal stage (Plate III., Fig. 7), the number of

Fig. 4

Fig. 5

Fig. 6

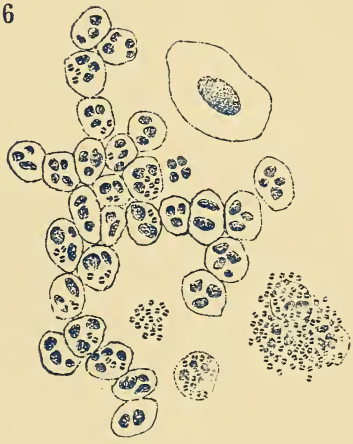


Fig. 7

Fig. 8

gonococci and pus cells becomes smaller, transition epithelium cells are numerous, pavement epithelium scanty. The serous secretion and shreds of this stage consist mainly of transition epithelium, a few gonococci and pus corpuscles. Among the transition epithelium are found not a few hyaline, "iodophile" epithelium cells (Fuerbringer) which stain rapidly with the weakest solutions of iodine.

In exacerbations after external noxa the number of pus corpuscles rapidly increases. It is a striking feature in such cases that, before the exacerbation has reached its height, the pus cells contain few gonococci, while the epithelium cells, which are usually aggregated in numbers, are covered with thick layers.

And thus the microscope furnishes no unimportant data concerning the duration of the process. If the orifice is slightly reddened and a slight mucous secretion is present, while the microscope shows that the secretion consists of abundant flat epithelium and numerous gonococci but few pus cells, we have to deal with a recent, beginning infection. If, with the same symptom complex, the secretion contains numerous transition epithelium, few pus corpuscles and gonococci, the process is approaching recovery.

The presence of numerous pus corpuscles and gonococci are evidence of the severity of the process, while few gonococci make the disease appear milder. But in order to draw any conclusion concerning the intensity of the process from the number of gonococci, we must examine a large number of preparations from the same day. The gonococci are not distributed uniformly in the pus, they are more abundant on one slide, less abundant on another, so that if we are satisfied with the examination of a few slides, we are apt to arrive at the opinion that their occurrence is intermittent and variable, while, on the whole, the number present in the pus runs quite a parallel course to the severity of the process. In the examination we should always use the pus which is obtained from the deepest part of the urethra by pressure from the outside. Apart from the fact that we thus avoid contamination with the bacteria, which are always present in the pus of the orifice, we obtain the pus from the most recent and freshly inflamed parts. This always contains more gonococci than the pus of the anterior parts, in which the inflammation has perhaps passed its acme at the time of examination.

Subjective Symptoms.—These are very variable. The most frequent and characteristic symptom is pain during urination. This varies according to the degree of inflammation. In the beginning it is slight and manifested by a mere feeling of warmth during the passage of the urine and for a little while afterwards. This is soon converted into a real sensation of pain. It is especially at the moment when the first drops of urine separate the swollen mucous membrane of the urethra that a burning pain is felt, at first not violent, but rapidly increasing in severity. At the height of the inflammation this feeling is so violent that the patients delay urination as long as possible, and hardly drink any fluids in order to avoid micturition. The common French term "chaude pisse" and the English "burning" owe their use to this symptom. After the acme of the inflammation has passed, the pain soon subsides and disappears long before the suppuration. In exceptional cases the pain may be slight despite abundant, even greenish suppuration, while slight suppuration is sometimes attended with violent pain.

The pain is located in the entire pars pendula, but one point, usually the orifice or fossa navicularis, more rarely the penoscrotal angle, is generally mentioned as the chief site of the painful sensation. In some cases, finally, the pain, which began during the acute stage, remains long after the general inflammatory symptoms have subsided.

In addition to the pain on micturition spontaneous pains also occur. Before the affection reaches its acme these pains are especially distressing, and consist partly of entirely spontaneous, lancinating pains along the pars pendula, partly of pains which are produced by pressure, improper position of the penis, movement and the sitting posture. In severe cases they extend into the testicles, groins and along the seminal ducts, and impede every movement of the patient.

Sexual Irritative Symptoms.—These are hardly ever absent in a case of acute urethritis. They begin in the prodromal stage and manifest themselves by morbidly increased sexual desire, more frequent and vigorous erections, increased impetus coeundi. This not infrequently leads to indulgence in sexual excesses, which are usually associated with increased voluptuous sensations. But this condition, which is usually not disagreeable to the patient, does not last long. When the in-

flammatory symptoms are fully developed, the increased sexual excitability constitutes one of the greatest sufferings of the patient. As in the prodromal stage frequent and very vigorous erections set in, but the swelled mucous membrane of the urethra does not answer to the demands for space caused by the elongation and broadening of the tensely filled corpora cavernosa; it has lost some of its elasticity. The patients therefore complain, at each erection, of a feeling of distention and dragging of the urethra. If we have the opportunity of examining the rigidly erect penis in this stage, we find not infrequently that the meatus and surrounding parts are drawn, in a funnel shape, into the urethra by the rigid mucous membrane. This feeling of tension increases to one of considerable pain by clonic contractions of the ischio-cavernosi and bulbo-cavernosi muscles, whose action not infrequently forces the penis, like a pendulum, against the abdominal walls. But it is particularly the moment of ejaculation, during the pollutions provoked by the sexual irritation, that is attended by violent pain. If the inflammation and sexual irritation are violent, the intense erections and the consequent ejaculation of semen may produce direct ruptures of the mucous membrane, hemorrhages, and thus a bloody color of the pus and semen—a condition which is known as Russian clap.

The sexual irritation is constant. Every external influence which stimulates the sexual sense may produce erections very quickly in patients in this condition, even when normally of a cold disposition. The erections are especially provoked by the heat of the bed. Hardly has the patient, who is usually filled with dread of the coming night, gone to bed and fallen asleep, when the first erection ensues and he is rudely awakened by the pain. When walking on the cold floor, the application of cold compresses, etc., have relieved the erection and the patient again retires, the erection appears anew and the night is thus full of misery.

Not infrequently the erections are constant and last for hours or half a day. If the corpus cavernosum urethræ, on account of the swelling of the urethral mucous membrane, cannot follow the increase in size of the corpora cavernosa penis, this gives rise to deformity in the shape of the organ. In the mildest grade the glans alone is bent downwards (this was called "un gland arqué" by Ricord); in the severer forms

the entire penis assumes an arched shape, with the concavity downwards. This is the condition known as chorda venerea. In contrast to the inflammatory chordee due to inflammatory irritation of the corpora cavernosa, this is also known as spasmodic chordee, because some observers, such as Milton, Koelliker and Hancock, do not regard it as a purely passive process, due to diminution in the elasticity of the urethral mucous membrane, but as a spasm of the longitudinal fibres of the smooth muscular layer in the submucous tissue of the urethra.

Chordee is one of the most distressing symptoms of acute urethritis. The pain explains the brusque manner in which the patients endeavor to rid themselves of it, by placing the curved and erect penis upon a hard substance and endeavoring to straighten it by a blow of the fist. Breaking chordee in this manner is an extremely old custom. Abu Oseiba mentioned it in 940 A.D. This practice is usually disastrous to the patient. The violent injury generally causes rupture of the urethra with violent hemorrhage, perhaps followed by inflammation of the corpora cavernosa, or at least by cicatricial stricture of the urethra after recovery. Paul (1875) and Jullien (1886) mention such cases. Voillemier lost a patient from the hemorrhage. One of Dufour's (1854) patients performed coitus when suffering from chordee. Severe hemorrhage set in afterwards, the penis became swollen, ecchymoses in the skin appeared, and dysuria set in. Despite vigorous antiphlogosis, gangrene of the penis set in, cystitis and death after typhoid symptoms. The autopsy showed ammoniacal cystitis with ulcerations, pyelit s, and suppurative nephritis; the urethral mucous membrane was torn 3 cm. and 6 cm. from the orifice, the lower rupture led into a gangrenous cavity. Similar symptoms may also occur after chordee without external injury. Villeneuve (1873) reports a case in which chordee was followed by gangrene, and this by pyæmic symptoms, phlebitis of the prostatic plexus, metastatic abscesses in the liver and lungs, and death.

Disturbances of the Discharge of Urine and Semen.—The notable diminution of elasticity, associated with swelling of the urethral mucous membrane, causes disturbances in the discharge of urine and semen. The swelling of the mucous membrane produces narrowing of the lumen, which becomes so much

more evident because the patient does not employ abdominal pressure on account of the pain. The urine is therefore evacuated in a narrow, feeble stream, which, when the pain is great, is often interrupted on account of the reflex contractions of the compressor urethræ. When the inflammatory symptoms are pronounced, the irritation of the first drops of urine may be so intense that reflex contraction of the compressor occurs at once and continues spasmodically for some time. True dysuria may develop, inasmuch as this spasm occurs with every attempt at micturition. The diminution in the elasticity of the swollen urethra is also a cause of the insufficient movement and slow discharge of the urine, but it is especially the last drops in the rigid tube formed by the swollen mucous membrane which remain behind and only escape gradually. Incontinence is thus a not infrequent symptom of urethritis. Ejaculation is impeded in the same way, and the semen escapes slowly and drop by drop from the urethra.

General Symptoms.—Blenorrhœa, however severe, always remains a local disease. Nevertheless its acute stage is always accompanied by a series of usually mild general symptoms. Slight chilliness, fever of slight grade (rarely over 38°), malaise, anorexia and mental depression develop. The appearance of the patient usually suffers; he has a sallow, yellow complexion, and the sunken eyes, with rings around them, disfigure the hitherto healthy and robust individual. Many of these phenomena are the result of psychical factors, the insomnia due to the sexual irritation, and the changed mode of life, especially the abstinence from alcoholics. But these factors do not explain the general symptoms entirely. The direct migration of gonococci into the blood is hardly conceivable, but it cannot be denied that the vital processes carried on by the cocci in the urethral mucous membrane may produce chemical substances (ptomaines) which pass into the circulation and produce a toxic effect.

Course.—The regular course of acute anterior urethritis as just described is not observed in all cases, and it might even be regarded as exceptional.

In the typical course a period of incubation of three to five days is followed by a prodromal stage of hardly two days. The then beginning blenorrhagic process increases in severity for about fourteen days, reaches its acme in the third week,

and recovers at the end of two to three weeks, the entire process thus lasting five to six weeks. There may be variations, however, in every stage of the disease.

The period of incubation may be somewhat shorter or longer; the prodromal stage is less subject to change.

The length of the acute period until the height of the disease may be very materially prolonged, even though the process does not extend beyond the pars anterior.

This prolongation may result from the longer course of the entire acute stage, so that three or even four weeks may elapse before the disease reaches its height. It then looks as if the inflammation spreads more slowly over the entire mucous membrane.

Or the process reaches its acme at the usual time (about the middle of the third week or even earlier), but remains there for a week or more, instead of a few days.

The course of the disease is much more often prolonged by disturbances during the last stage. In typical cases the disease diminishes uniformly in intensity and extent, after the acme, in about three weeks. In many cases, however, this improvement is not uniform but interrupted. The disease improves, then remains at a standstill for a time, again improves, and so on.

In equally numerous cases recovery is interrupted by relapses. The process has passed its acme and made a step towards recovery, when suddenly a relapse sets in. The acuteness of the process, the secretion and subjective symptoms increase, and a second acme is reached, usually less pronounced than the first. Thus several relapses, whose intensity usually grows less with each succeeding one, interrupt the course of the disease until finally recovery is established. These relapses may even occur during the terminal mucous stage of clap.

The causes of this abnormal course are partly external, partly in the patient. It may result from constitutional anomalies. Scrofula, cachectic frame, poor nutrition, and syphilis delay the course of clap even without external noxa, and are at the bottom of numerous relapses. But pollutions are the most frequent cause of a protracted course. The physician then finds himself confronted by a vicious circle, which is not always easily broken. The acute process causes

erections and pollutions; these increase the acuteness of the inflammation and thus prove a renewed cause of increased sexual irritation. If the pollutions are numerous in the acute stage they intensify the inflammation; if they occur at the acme they prolong the latter, and in the terminal stage they are the cause of frequent relapses.

External causes may prolong the disease in a similar way. Coitus acts in an analogous manner to pollutions, as do excesses in Baccho, ingestion of spicy food, exhausting exercise, walking, riding, driving and dancing.

Intercurrent diseases also affect the course of blenorrhœa. In acute diseases all the symptoms cease so long as the fever continues. It seems to be cured, but returns after the cessation of the fever. Acute general diseases, which cause great prostration of the body, favor a protracted course of clap, and certain affections, particularly typhoid fever, are apt to cause very acute inflammation or even gangrene in urethritis (Hoelder, 1851). Colds, digestive disturbances, particularly intestinal catarrh, aggravate the course of clap. Finally we may mention that in severe jaundice the pus of gonorrhœa not infrequently possesses a deep, saffron-yellow color, which disappears with the removal of the jaundice.

Varieties.—We have already said that the severity and duration of the disease are subject to material variations. It is well to distinguish three large groups, which merge into one another.

1. *Subacute Form.*—The first infections rarely, repeated infections more often, assume a subacute torpid course from the start. The incubation and prodromal stages last longer, the intensity of the inflammatory stage is less, the pain, sexual irritative phenomena and general symptoms are almost or entirely absent. The secretion long remains serous, opalescent, gelatinous, although its amount may have increased. It never becomes more than muco-purulent, although pus can always be demonstrated microscopically and macroscopically at some stage, and I doubt the existence of a purely mucous catarrh after blenorrhagic infection. Gonococci can always be found quite abundantly in the secretion; in the beginning the flat and transition epithelium cells persist very long and always contain gonococci. The number of pus cells is relatively small. The impression is created in these cases as if

either the virus is weak or the receptivity of the soil is diminished and the gonococci have penetrated less deeply, so that epithelial desquamation suffices for their removal, and irritation of the papillary body with secondary emigration of pus cells occurs only to a slight extent. This form is as insidious as it is mild in its manifestations. The subjective symptoms are so slight that they are often entirely overlooked by the patient. Noxious influences may give rise to exacerbations, but these are often only temporary. And so the process spreads not infrequently to the pars posterior, and there gives rise to the development of subacute and chronic urethritis posterior and prostatitis.

2. *Acute Form.*—Purulent clap, the type of the acute urethritis as described by us, and is especially observed at the first infection.

3. *Peracute Form*, or phlegmonous clap, with intensification of all the objective and subjective symptoms. Incubation and the prodromal stage are short, the symptoms of the acute stage intense. Marked swelling of the entire penis with œdema of the prepuce, lymphangioitis, abundant purulent secretion, associated in rare cases with the exfoliation of croup-like membranes, or a reddish brown to black color of the pus on account of admixture with blood, marked symptoms of sexual irritation, chordee and pollutions, intense pains, pronounced implication of the general system; the number of gonococci in the secretion is often enormous.

Posterior Acute Urethritis.

In discussing the course of acute anterior urethritis we have mentioned that the inflammatory stage increases up to a certain point, and then slowly diminishes to complete recovery. The amount of secretion in the urine varies in a corresponding manner. If the test of the two vessels is made, the first urine passed alone is cloudy, the second is clear, and there is always a correspondence between the amount of pus escaping from the meatus and the cloudiness of the urine. The reason is evident. The pus produced in the pars anterior can only cloud the first urine, and not being retained by any muscular force, it must flow towards the orifice of the usually pendulous urethra.

In the third week occurs the turning point in the course of

urethritis, the acme which, whether longer or shorter in duration, always forms a boundary stone, which is indicative of a change. We are already acquainted with the change for the better, but a change for the worse may also occur. The blenorrhagic process, hitherto confined to the pars anterior, passes the compressor urethræ and extends to the pars posterior. The blenorrhœa thus attacks the entire urethral mucous membrane to the ostium urethræ vesicale.

With this transition the blenorrhagic process has become a much more severe disease. The typical course has not ceased altogether, but it is rarer. Disturbances of the typical course by complications and spread of the blenorrhagic process are more common, the prognosis more serious, the treatment is more difficult.

The spread of the disease to the pars posterior occurs at a time when the acuteness of the process in the pars anterior is diminishing and does not interfere with the latter. On the contrary, I am inclined to maintain that the development of posterior urethritis favors the rapid termination of anterior urethritis. Disease of the pars posterior spreads quite rapidly over the entire mucous membrane, and rapidly attains its maximum, but recovery then occurs very slowly, after a usually long protracted subacute stage. In other cases acute symptoms are absent and the course is subacute and protracted from the beginning.

The direct anatomical connection of the short pars posterior with a number of other organs, the prostate, bladder, seminal vesicles, epididymes, offers the most favorable condition for the spread of the inflammatory process, and urethritis posterior is often merely a temporary forerunner of cystitis, prostatis, vesiculitis, epididymitis.

Whenever these complications occur, posterior urethritis is always present. The latter is the agent in the production of these processes, but they may develop together, *i.e.*, posterior urethritis and prostatitis, cystitis and epididymitis may appear almost at the same time. Or the development of posterior urethritis may precede these complications for a long time. Thus, the former may almost have run its course, then relapse on account of external noxious influences, and the first or even a subsequent relapse may give rise to the development of the complications mentioned.

I have already said that posterior urethritis occurs after the acme of anterior urethritis. It does not develop, therefore, before the beginning of the third week after infection, except under special circumstances, as, for example, examination of the diseased urethra with the sound and direct transport of blenorrhagic pus to the posterior portions of the urethra at an earlier period.

As a matter of course it may develop at a later period. It does not develop necessarily after the first acme, but may follow a relapse of the anterior urethritis.

After an examination of fifty cases Heisler (1891) states that posterior urethritis occurs

In the	1st	week	after	infection	in	20	per	cent.
"	"	2d	"	"	"	" 34	"	"
"	"	3d	"	"	"	" 14	"	"
"	"	4th	"	"	"	" 20	"	"

Despite careful observation I have never observed such an early development in cases which were not treated locally.

Rona (1891) occupies an exceptional standpoint. He maintains that every urethritis which has extended to the bulb also passes into the pars posterior. According to him anterior urethritis affects only the pendulous portion, while posterior urethritis involves the bulb, membranous and prostatic portions.

The causes of the development of posterior urethritis are internal and external.

Internal causes are to be looked for in the constitution of the patient. In cachectic individuals, those suffering from chronic diseases, such as tuberculosis, scrofula and syphilis, anterior urethritis is generally followed spontaneously by posterior urethritis, usually about the third week. Even without a decided cachexia the urethra of some individuals forms a favorable soil for the virus, and it is particularly blonde, slender individuals, with a tendency to catarrh in general, who also have a tendency to the development of posterior urethritis. It is also certain that a patient who has once suffered from posterior urethritis, will again be attacked by it during the course of another infection.

In all these cases the extension of the disease occurs

immediately after the first acme, *i.e.*, in the third week, and usually without any noticeable subjective symptoms.

All the external causes which give rise to an exacerbation or relapse of anterior urethritis, excesses in venere and Baccho, spicy food, alcoholics, pollutions, excessive exertion, may also cause the spread of the process to the pars posterior. This is also true of premature or unskilful injections with strong or non-antiseptic fluids, or of instrumental interference during the course of anterior urethritis. Under such circumstances the latter usually develops brusquely, with notable subjective symptoms.

If the anterior urethritis had been reduced to slight symptoms at the time of the action of the irritant, exacerbation of the former usually remains absent in case posterior urethritis develops.

The relative frequency of anterior and posterior urethritis cannot be accurately determined. Leprevost (1884) claims to have observed posterior urethritis in $\frac{1}{6}$th, Eraud (1886) in $\frac{4}{5}$ths of all cases. Jadassohn (1889) has observed it in 87.7 per cent. of his cases of urethritis which had lasted four to six weeks. According to Letzel, it occurs in 92.5 per cent. of cases which have lasted seven to ten weeks. In cases of urethritis lasting eight to ten weeks Rona (1891) found posterior urethritis in sixty-two per cent. and in sixty-six per cent. of cases which lasted longer.

These differences of opinion depend in part upon the method of examination. It is evident that the test of the two beakers will show a smaller proportion of cases than the more exact irrigation test, which is carried out in the following manner. Several hours after the last micturition the pars anterior is washed out with sterilized water by means of a catheter introduced as far as the bulb, and the urine which is passed immediately afterwards is then examined. If not properly performed, however, this test may apparently demonstrate a posterior urethritis which does not exist. The irrigation may not wash out all the pus from the pars anterior, or the catheter may carry secretion into the membranous urethra. This pus will then appear in the urine and will be regarded as the secretion of the pars posterior.

The proportion of posterior to anterior urethritis will also vary according to the clinical material. Thus the former is

comparatively rare in hospital patients, who remain in bed under strict supervision during the course of an acute urethritis. It is more frequent among the better class of private patients, but most frequent among dispensary patients. There were sixty-three per cent. among my private patients, eighty-two per cent. among my dispensary cases.

If the extension of the process to the pars posterior occurs without symptoms, the anterior urethritis appears to run its normal course and to approach recovery. But one symptom will not escape us if the patient is examined with any degree of care. On examining the urine it will be found that the cloudiness is considerable when compared with the diminishing suppuration visible at the orifice of the urethra. This circumstance alone is an indication that, in addition to the small amount of pus produced in the pendulous portion, and which can cause only slight cloudiness of the urine, the cloudiness must be due to some other cause.

If we now make the test of the two beakers, *i.e.*, direct the patient to pass the urine in two portions, not alone will the urine in the first glass be found very cloudy, but also that in the second glass, though to a much less extent.

The latter can result only from cloudiness of the urine in the bladder. All the pus which remains in the urethra is washed away by the first stream of urine, and if the urine in the bladder itself is clear, that passed into the second vessel must also be clear.

The pus of anterior urethritis can freely escape externally, but its entrance into the bladder is prevented by the firm closure of the compressor. What becomes of the pus produced in the pars posterior?

The tonus of the pars membranacea and prostatica normally closes these parts in such a way that no lumen, or only a capillary one, is present. This tonus is still further increased by the inflammatory irritation, and the accumulation of large amounts of pus is therefore impossible.

The pus of the pars membranacea will endeavor to escape from the tube which compresses it on all sides, and will therefore flow forwards into the bulb, backwards into the pars prostatica.

The pus of the prostatic portion will endeavor to escape in the same way. Its escape anteriorly is prevented by the

tonic contraction of the pars membranacea. There is no obstruction posteriorly, because the bladder is not closed against the urethra and possesses no power to prevent the entrance of solid or fluid bodies from the prostatic portion. The pus of the pars prostatica will therefore enter the bladder and cause cloudiness of the urine accumulated there. Another circumstance must be taken into consideration. So long as the bladder is moderately filled the pars prostatica remains closed. But when the bladder becomes fuller the pars prostatica is used for the reception of the urine. It is therefore evident that the pus produced in the pars prostatica and in part deposited in it will be mingled with the urine in the bladder. The cloudiness of the urine will therefore be most marked when prolonged retention of urine permits the formation of larger amounts of pus. On the other hand the pus will only enter the urine when its amount is so large that it no longer finds room in the pars prostatica. When micturition is frequent, and when only small amounts of pus are produced which could not enter the bladder, the urine accumulated in the bladder will remain clear. Hence the same individual will pass a clear second urine if micturition is frequent, and a cloudy second urine if micturition is infrequent. These frequent changes from a clear second to a cloudy second urine are one of the most important characteristics of acute posterior urethritis, and an important differential sign between urethritis and cystitis, in which the mucus and pus which cloud the urine are produced in the bladder itself, and therefore a second clear urine is impossible.

If the posterior urethritis is very acute, the second urine is always cloudy; if it is subacute and the quantity of pus smaller, the urine will only be cloudy after prolonged retention.

Posterior urethritis also presents a tendency to nocturnal exacerbations. The prolonged retention of urine at night thus coincides with the greater production of pus, and individuals who, during the remission of the inflammation in the day time (when they also urinate more frequently) pass a clear second urine will present a distinct cloudiness of the second urine passed in the morning. Hence follows the important rule that posterior urethritis cannot be excluded unless the second portion of the first urine passed in the morning is clear.

The test of the two vessels, especially with the morning

urine, will permit us to make a diagnosis even in cases of slow posterior urethritis, which begin without any symptoms.

In these cases the first portion of urine is always more cloudy than the second. The urine has been made cloudy in the bladder, but the first portion, in its passage through the urethra, carries with it all the pus found there. The second portion passes through the urethra after it has been cleansed of pus, and is therefore not rendered still more cloudy.

The degree of cloudiness of the second urine, since it depends upon the excess of pus produced in the pars posterior, is a gauge of the intensity of the inflammation.

In some cases posterior urethritis develops brusquely, and is characterized by a series of often very typical symptoms.

Among these the vesical tenesmus is the most striking, and the most annoying to the patient, and its severity is proportionate to the degree of inflammation. In the most acute cases the tenesmus is constant and extremely distressing. It forces the patient to urinate every five to ten minutes. The amount of urine discharged is then very small, since too little time is given for the filling of the bladder. The micturition does not relieve the tenesmus, which continues whether the bladder is full or empty. It is entirely independent of the urine and is not produced by the irritation of the latter. In discussing the physiology of the subject, we stated that the normal desire to urinate is called forth by the stimulus exercised by the urine upon the pars prostatica. But this feeling can also be provoked by other means—for example, by the introduction of a bougie or catheter. This is also the case when violent inflammation irritates the pars prostatica.

The irritation of the inflamed mucous membrane of the pars prostatica then causes permanent desire to urinate, and hence its complete independence of the condition of fullness of the bladder. Every influence which intensifies the inflammation also increases the vesical tenesmus. It is therefore increased by rapid movement, especially driving and riding, and diminished by quiet.

The vesical tenesmus is more characteristic in subacute than in acute cases. If the patient has evacuated the bladder he feels no tenesmus so long as the organ is gradually filling. But after retention of urine for a few hours the desire to urinate, which can usually be overcome without difficulty by

healthy individuals, becomes at once so imperative that the patient cannot restrain it, at the danger of involuntary micturition. The physiological desire to urinate is caused by the stimulus of the first drops of urine which, when the bladder is full, pass into the posterior portion of the pars prostatica. The desire is slight at first, and increases with the amount of urine entering the pars prostatica and the increasing pressure to which it is subjected.

If the mucous membrane of the pars prostatica is moderately inflamed, the stimulus of the inflammation will not produce spontaneous desire to urinate. But the first drops of urine which reach the inflamed mucous membrane will produce, instead of the physiological, an intense desire whose severity varies according to the degree of inflammation.

The more acute cases of posterior urethritis are usually accompanied by hæmaturia. In the milder cases of hæmaturia a few drops of blood only appear on pressing out the last drops of urine. This blood is squeezed out of the inflamed, perhaps eroded mucous membrane of the pars prostatica by the contractions of the sphincters of the bladder; it does not come from the bladder but from the pars posterior. This was proven by Horovitz (1885). When the last drops of urine were passed, in patients suffering from hæmaturia, he introduced an elastic catheter into the bladder, washed out the organ, and allowed the instrument to remain. The urine discharged from the bladder through this catheter was found to be free from blood, a clear proof that the hemorrhage is not situated in the bladder itself. When the hemorrhage is more severe the blood which flows from the pars posterior, enters the bladder with the pus and gives the urine a bloody color. The patient then passes urine which is bloody in both portions, and a few drops of blood are voided with the last drops of urine. As a matter of course violent tenesmus is always associated with this acute stage.

The views here expressed concerning posterior urethritis are generally accepted, but some dissenting voices have been raised.

Fuerbringer (1890) is not convinced by the arguments adduced in favor of the regurgitation of pus from the pars posterior into the bladder, and assumes a cystitis whenever cloudiness of the second portion of the urine, tenesmus, and terminal hæmaturia are observed.

A very different view is held by M. v. Zeissl (1888). He denies the possibility of the regurgitation of pus from the pars posterior into the bladder, and maintains that the second portion of urine is clear in every prostatic urethritis, and that its cloudiness always indicates cystitis. On the other hand, he acknowledges that tenesmus and terminal hæmaturia are observed in prostatic urethritis without affection of the bladder. Hence it follows that there must be cases in which tenesmus and terminal hæmaturia are present but the second portion of the urine is clear. Such cases have not been described by any observer. The simple fact is that cloudiness of the second portion of the urine, with or without tenesmus, is often observed during the course of blenorrhœa. The question then arises, is cystitis present in all these cases, as Fuerbringer assumes, or does mere disease of the pars posterior, without implication of the bladder, suffice to produce these symptoms, as we have good reason to believe?

Subjective Symptoms.—Other subjective symptoms are almost always noticeable. The patients usually complain of burning, tickling, perhaps of slight lancinating pains in the deep portions of the urethra and towards the anus, which often increase after micturition and defecation.

Sexual Irritative Symptoms.—These vary according to the intensity of the process, and are analogous to those observed in acute anterior urethritis. Priapistic, painful erections are generally absent. The erections are painless but, on the other hand, pollutions are frequent and the moment of ejaculation is accompanied by a sticking pain in the deep portions of the urethra. The pollutions which are especially frequent in subacute posterior urethritis, and often occur several times a week, owe their development to the inflammatory irritation of the caput gallinaginis and are so characteristic that if a patient begins to complain of frequent pollutions in the third or fourth week of an urethritis, the physician should always examine concerning the existence of a posterior urethritis.

Secretion.—The secretion is analogous to that of anterior urethritis, *i.e.*, muco-purulent, the proportions varying according to the acuteness of the inflammation. The more acute inflammations always produce more pus. The turbid urine in the two beakers will therefore deposit the same two

layers, an upper mucous and a lower purulent layer, in varying proportions. Examination of the pus corpuscles of the urine in the second glass with alkaline methyl blue almost always shows a greater or smaller number of characteristic gonococci heaps.

In rarer cases the sediment of the second portion, or the secretion after washing out the pars anterior, does not contain gonococci. In such cases there is merely a mild affection of the pars posterior. While the secretion of the pars anterior is abundant and purulent, the second urine shows only slight cloudiness or only a few shreds are found in the urine after washing out the pars anterior. Jadassohn (1892) believes that in these cases the posterior urethritis is due to the carrying of toxines of the gonococci into the pars posterior through the medium of the circulation.

On the other hand posterior urethritis is associated with a symptom peculiar to it, *viz.*, a not inconsiderable albuminuria. An amount of albumin is found in the filtered urine on boiling and on the addition of nitric acid, which is out of proportion to the pus. This albuminuria is intimately connected with the vesical tenesmus, increases and diminishes with the latter, and reappears on the reappearance of the tenesmus. The origin of this symptom is not fully explained. It is conceivable that, among the many reflex symptoms produced by acute inflammation of the pars prostatica, albuminuria also constitutes a reflex, vaso-motor disturbance. Ultzmann (1880) accepts Runeberg's theory. According to the latter writer albumin will filter from the glomeruli into the renal tubules of the healthy kidney, either when the arterial pressure in the glomeruli diminishes or the pressure in the tubules exceeds the secretory pressure, as happens in damming back of the urine in the ureter. Now the acute inflammation of the pars posterior and the violent tenesmus which it produces, give rise to reflex muscular spasms. Detrusor spasm also appears to occur and increases the tenesmus. Inasmuch as the ureters run transversely through the muscular fibres of the detrusor vesicæ, spasmodic contraction of the latter will compress the lowermost part of the ureters, give rise to damming back of the urine and thus to albuminuria. The latter will cease as soon as the reflex detrusor spasm subsides with the cessation of the tenesmus, and will return with the recurrence of the spasm.

As a matter of fact, this albuminuria may be relieved by the administration of narcotics. I have repeatedly made this observation, which is denied by Fuerbringer, and regard the presence of a large amount of albumin in posterior urethritis as an evidence of severe irritation. Hence, albuminuria always constitutes a warning not to begin with local treatment. Balzer and Souplet (1892) have recently studied albuminuria in blenorrhœa. Among 424 patients 99 suffered from albuminuria out of proportion to the amount of pus in the urine. Among these 99 patients, 62 suffered from epididymitis, 11 from epididymitis and cystitis, 5 from cystitis, 21 from uncomplicated blenorrhœa. In the 78 complicated cases there was no doubt of the presence of posterior urethritis. Unfortunately the authors do not mention whether the 21 cases of uncomplicated blenorrhœa were localized in the pars anterior or also involved the pars posterior.

General Symptoms.—These are similar to those of anterior urethritis, but are usually more intense. The acute form with its distressing tenesmus is accompanied by the most severe general symptoms. The tenesmus, although constant, is subject to spasmodic exacerbations whose intensity often causes the patients to cry out aloud and brings beads of perspiration to their brows. The general condition then is usually very much depressed, the sallow complexion and the rings around the eyes convey the impression of a serious disease. Fever is generally present. The appetite is usually lost, and there is often obstinate constipation.

In the subacute cases the general organism is not noticeably affected.

Forms.—According to the intensity of the process we distinguish three typical forms of the disease.

1. *Subacute Form.*—A predominantly catarrhal disease with production of an almost exclusively mucous secretion, which contains few pus cells. In many of these cases the second portion of the urine is only cloudy in the morning, but clear during the day. The subjective symptoms are confined to somewhat imperative, perhaps more frequent, desire to urinate.

2. *Acute Form.*—The secretion more purulent, its amount greater, so that the second portion of urine is almost always cloudy and is only clear occasionally during the afternoon,

when the remission of the inflammatory process coincides with the more frequent micturition resulting from the meal. Subjective symptoms are more severe, especially more frequent and imperative tenesmus.

3. *Peracute Form.*—The secretion abundant and purulent, the second urine always very cloudy, tenesmus very violent, hæmaturia after micturition, subjective symptoms marked, general condition very much affected.

Course.—We have already said that acute posterior urethritis usually reaches its acme rapidly, and then takes a slow course before complete recovery. The stage of greatest intensity may become ominous from the fact that the inflammatory process may extend beyond the urethra to adjacent structures, the prostate, bladder, epididymes, and produce inflammation of these organs.

The slow course of the stage of recovery may be delayed still further by the fact that external injurious influences may induce relapses, and these may be followed by complications.

In like manner the frequent pollutions provoked by the process itself may cause notable prolongation of the acme of the inflammation, increase of the inflammatory symptoms and relapses.

With the long duration of the acute stage and the frequent relapses, recovery is made difficult and the development of chronic changes is favored.

Diagnosis and Differential Diagnosis.

If we have a patient suffering from a mucous, muco-purulent or purulent discharge from the urethra, two questions must be answered: 1. Is this discharge gonorrhœal? and 2. How far along the urethra does the gonorrhœal disease extend, particularly with regard to the compressor urethræ?

The first question is answered by the results of microscopical examination, and depends directly on the demonstration of gonococci in the pus or muco-pus. This question is so important, and attended with so much responsibility to the physician, that it necessitates careful examination. A single examination is often insufficient.

The number of gonococci in the purulent and muco-purulent secretion of florid blenorrhagic urethritis is usually con-

siderable. If we have examined several, at least two to four, cover-glass preparations from an acute suppuration of the urethra and have not found gonococci, the negative results exclude blenorrhœa.

This is not true of the mucous secretions of the initial and terminal stages. In these the number of gonococci is small, particularly in the terminal stage. Accordingly, if we find no gonococci in several preparations, we should not exclude blenorrhœa, but should repeat the examinations later and also take the course of the disease into consideration. If the mucous secretion has only lasted a short time, it will soon be converted into a purulent secretion, in which the demonstration of gonococci is not difficult, and clears up the diagnosis. If we have to deal with the terminal stage, this must have been preceded by a purulent discharge, as will appear from the patient's statements. The process will then either subside spontaneously in a little while and thus make the question of its character unnecessary, or a relapse will occur with purulent secretion, in which the demonstration of gonococci is generally easy.

But in every case in which the diagnosis of blenorrhœa is made, the micro-organisms found by us must be fully proven to be gonococci, and must possess a series of characteristics. The absence of even one of these makes the diagnosis doubtful. These characteristics are:

a. Shape.—We have already described gonococci, and will here merely call attention to their shape, which resembles that of coffee beans, and to the fact that, inasmuch as they are diplococci, they are always found joined in twos and twos, with their flat or slightly concave surfaces directed towards one another.

b. Grouping.—The mode of their division gives rise to the circumstance that the gonococci are never found in chains, however short, but always in heaps. Within these groups we usually find two cocci pairs closer to one another in sarcina shape. The number of single cocci (not in pairs) is always divisible by two, but usually also by four.

c. Staining.—Gonococci are readily stained by aniline colors, but they also lose their staining readily in comparison with the majority of other cocci. They are decolorized by treatment with alcohol, according to Gram's method, while this

does not affect the staining of most other cocci. In order to demonstrate this, a cover-glass preparation is stained with gentian violet aniline-water, placed for one minute in potassium iodide solution, washed, decolorized in alcohol, and then stained with a watery solution of fuchsin. The gonococci then appear red, while other cocci and bacteria have a deep blackish-blue color.

d. Position.—The heaps of cocci must always be found in the protoplasm of pus cells. This is proven by the fact that the cocci and the contour of the cell nucleus are equally distinct at the same focus, and that the cocci do not project beyond the edge of the protoplasm. The number of gonococci in one cell varies from one or two pairs to complete distention of the entire cell body, which often appears dilated. Very characteristic of cocci, also, is the finding of nuclei of pus cells, enclosed in heaps of gonococci, and which no longer present a cell contour. The cocci pairs are then usually aggregated more closely towards the centre, more loosely towards the periphery of the mass. These masses are derived from the destruction of pus cells which have been filled with cocci.

e. Number.—If a purulent secretion is really blenorrhagic the number of gonococci heaps is always considerable, and the discovery of a few diplococci, even if situated in cells, is not convincing.

Lustgarten and Mannaberg (1887) have recently attacked the diagnostic significance of gonococci, in view of the discovery of diplococci also enclosed in cells, in the normal urethral mucous membrane. So far as concerns acute urethritis I must oppose their views (I will discuss at a later period the significance of gonococci in the diagnosis of chronic urethritis). For many years I have had the opportunity of examining, with regard to micro-organisms in the pus, every case of acute and chronic urethritis (and their number is not small) which came under my observation. There is no doubt that, in addition to gonococci, other micro-organisms are also found in blenorrhagic pus, but these never give rise to even the slightest diagnostic doubt. The number of foreign micro-organisms, especially cocci, is so slight, and they are found to such a large extent outside of cells (with few exceptions), and their shape and grouping are so different from those of gonococci, that the differences in staining (which were not tested by Lustgarten and Mannaberg) are unnecessary

to make a positive differential diagnosis. The impression is never created that these cocci are due to more than accidental soiling, or that they increase in the pus. In fact the vital conditions in the normal and blenorrhagic urethra are so different that, without strict proof, we can hardly arrive at the conclusion that the micro-organisms of the normal urethra can be propagated in the blenorrhagic canal.

Steinschneider and Galewsky (1889) have found four varieties of diplococci in the normal urethra and the secretion of blenorrhœa. They are distinguished from gonococci by means of Gramm's method and also by the facility with which they may be cultivated. Petit and Wassermann (1891) found in the normal urethra five kinds of cocci, six kinds of bacilli, two sarcinæ, two yeast spores, none of which proved pathogenic. They were unable to find the pseudogonococci of Lustgarten and Mannaberg.

The direct proof that a urethral suppuration is blenorrhagic must be adduced, for the reason that there is also a series of other catarrhal affections of the urethra which present similar symptoms.

Thus, chemical and mechanical irritants, which act upon the urethra, produce symptoms which apparently are entirely like those of clap. These suppurations can be distinguished from those of blenorrhœa by two factors. In the first place, incubation is wanting, the reaction follows the irritant influence at once, rapidly increases to its acme, and soon disappears. The suppuration is confined to the part of the mucous membrane which has been injured by the irritant, and presents no tendency to migration and peripheral spread, and no tendency to a protracted and chronic course.

Any one who has the opportunity of making injections of concentrated astringents into the urethra, may convince himself of this fact.

If a patient, suffering from chronic urethritis, receives an urethral injection of a two to ten per cent. solution of nitrate of silver, violent reaction occcurs at once, attended with violent, burning pain. Three or four hours after the injection, thick, creamy pus, like that of acute urethritis, is discharged, and the urine is very cloudy, but the entire reaction rapidly diminishes within twenty-four hours. The same observation may be made in those cases in which, usually by accident, caustic injections have been made into the healthy urethra.

Fig. 9

Fig. 10

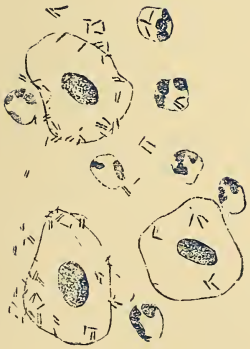
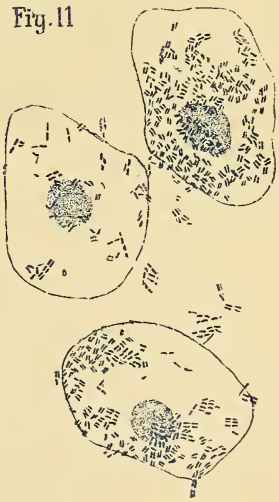


Fig. 11



The adherents of the theory which denies the existence of a blenorrhagic virus also deny the difference between clap and traumatic and chemical catarrhs, as regards incubation and course, and they oppose a thousand-fold experience with the single experiment made by Swediaur (1798).

This writer injected a solution of ammonia into his own urethra, and suffered in consequence from an urethritis which developed without incubation, extended in three exacerbations as far as the neck of the bladder, and lasted seven weeks. Entirely apart from the fact that this experiment confirms the difference, so far as regards incubation, between virulent and non-virulent blenorrhagia, it is time to control this experiment, which is a century old and performed under one knows not what conditions, by others made with proper precautions, or to allow it to rest, like Hunter's experiment, and to regard it as a mere historical curiosity.

Urethral catarrhs, usually of a mucous character, can also be produced by other irritants.

Thus, slight mucous or muco-purulent catarrhs, which rapidly heal spontaneously, develop after coitus with menstruating or leucorrhœic women. Microscopical examination of the secretion usually shows several diplococci and rod varieties, one of which (Plate IV., Fig. 10), in view of the constancy of its occurrence in several cases, and its notable predominance over other rods and cocci, perhaps stands in a close causal relation to the affection. Gonococci were absent in these cases, despite the tolerably abundant suppuration and the careful examination of numerous preparations.

But purulent urethral catarrhs with a mild course also appear to be produced by other pathogenic micro-organisms than gonococci. Aubert (1884) reports three cases of urethritis, in which he found one and the same form of coccus; one case was followed by epididymitis and cystitis. Bockhart (1886) reports fifteen cases of infection — among these were ten married men—produced by vaginal secretion, which was followed by mild muco-purulent catarrh; in two cases alone did it extend to the pars posterior and epididymis. As the cause, Bockhart found extremely small cocci, analogous to gonococci; he made pure cultures and performed two inoculations with positive results. In two other cases evident streptococci were found.

Mild muco-purulent catarrhs of the urethra with slight se-

cretion, which are manifested merely by agglutination of the meatus and a few flakes in the urine, may occur as symptoms of syphilis. Lee, Vidal and Hammond discuss this affection, but the most detailed description was furnished by Tarnowsky (1872). They consist in the formation of superficial erythematous or papular efflorescences on the mucous membrane of the urethra, which occur as a part of a general secondary syphilis or alone as a relapse of the secondary syphilide. These erythematous or papular ulcerations secrete the small amount of catarrhal or, though rarely, purulent secretion, which appears at the meatus and simulates blenorrhœa. Examination of the secretion, the demonstration of recent syphilitic symptoms or their residua, the previous history and the results of antisyphilitic treatment prove the diagnosis of syphilitic as distinguished from blenorrhagic urethritis.

Finally, attention must be called to still another affection. Diday (1860) first directed special attention to patients who complain of obstinate urethritis and constantly express a drop of pus from the meatus. If we examine carefully it is found that this pus does not come from the meatus, but from small openings on the inner surface of the lips of the meatus. In this locality are found glands, whose short excretory ducts empty on the inner surface of the lips of the urethra. Purulent catarrh of these glands often occurs independently, perhaps also as the result of blenorrhœa, and can only be cured by destroying them with hot needles.

The similarities between soft and hard chancre at the orifice and blenorrhœa are so remote, and the differences usually so distinct, that it is sufficient to mention them as possible causes of error.

The second question presented refers to the extent of the process, *i.e.*, whether we have to deal with an urethritis anterior or posterior. This question is answered in every case by the test of the two beakers. A first cloudy urine and a second clear urine indicates a simple anterior urethritis; a second cloudy urine means posterior urethritis. But even in posterior urethritis the second urine may be clear occasionally, and it is therefore advisable to make several examinations. The morning urine is especially decisive, in the first place because the patient has not urinated for the longest time, and then because the morning exacerbation coincides with the retention of urine

for several hours. I can recommend as very practical and easily carried out a method which I have employed for several years with good results. The patient is directed to bring at each visit the morning urine divided into two portions, and also to retain the urine in the bladder for several hours before the visit. If he then passes the urine into two vessels, and this plan is carried out from the beginning of the blenorrhagic stage, we are always kept accurately informed concerning the extent of the process.

If the second urine is occasionally or constantly clear, as in subacute cases or the terminal stage of acute posterior urethritis, the differential diagnosis may be made by means of the irrigation test, recommended by Smith (1880) then by Aubert, Eraud, Du Castel, and recently by Goldenberg (1888) and Jadassohn (1889). After the patient has abstained from urinating for several hours, an elastic catheter is introduced as far as the bulb and the pars anterior washed with a weak solution of borax, by means of an irrigator or hand syringe. If the urine passed after irrigation is clear, anterior urethritis alone is present; if it contains flocculi and shreds or is slightly mucous and cloudy, posterior urethritis is also present. I have already spoken of the possible errors of this test.

Every reader of these lines and every observer will have been struck by the great similarity between posterior urethritis and cystitis. A few distinctions between the two diseases have been already noted; the differential diagnosis will be discussed in the consideration of cystitis.

Prognosis.

Simple and uncomplicated blenorrhœa, whether situated in the pars anterior or posterior, is a harmless affection in the large majority of cases. The prognosis as regards duration is not so good. Here Ricord's dictum holds true: "Une chaude pisse commence, Dieu le sait quand elle finira."

The causes of its transition into a chronic condition are innumerable, and such an event is connected with so many circumstances which are independent of the physician, and in part of the patient, that the former should be very reserved in making a prognosis. Urethritis with short incubation and quite rapid onset has a more favorable prognosis as regards rapid termination than the subacute forms, in which the in-

cubation lasts longer, and the process slowly reaches a mild acme. For this reason, also, the prognosis as to duration is more favorable in the first infection than in repeated infections, which generally run a subacute course.

Caution in prognosis is therefore necessary, because the process becomes aggravated with its duration, and also because of the various sequelæ and complications.

A series of complications may even give rise to symptoms which threaten the life of the patient.

Thus, Post (1887) and Park (1888) have collected a number of fatal cases due to phlebitis of the prostatic plexus, prostatic and periprostatic phlegmons and abscesses, peritonitis after inflammation of the seminal vesicles, prostate and epididymis, cystitis and pyelonephritis. Among the more remote complications gonorrhœal rheumatism, endocarditis, and pericarditis are more apt to terminate fatally.

Even a simple uncomplicated blenorrhœa may cause serious, dangerous symptoms on account of the intensity of the inflammatory phenomena. We have mentioned a few of these fatal cases in describing chordee.

Apart from this complication an acute urethritis may terminate fatally when the inflammatory symptoms become very acute *per se*, or as the result of external irritants, or of especially unfavorable dietetic and hygienic influences.

Gervais (1866) mentions three cases in which dangerous hemorrhages from the urethra were caused by coitus in the acute stage of urethritis. In Paul's case (1875) excesses in the diminishing stage of an acute clap were followed by hemorrhage from the pendulous portion. An obstinate stricture developed at the point of rupture.

Even without external influences urethritis may give rise, though rarely, to extremely dangerous symptoms. Jeszensky (1882) reports the following case: A peasant, æt. twenty-three years, who had coitus for the last time a week before, was admitted on September 8, 1882, to the Rochus Hospital in Pesth, suffering from an urethritis of five days' standing. On admission the entire penis was found swollen, cold, and the integument bluish green. The swollen glans was partly covered by the œdematous prepuce; abundant purulent discharge from the urethra. Scarification of the integument of the penis was performed. The wounds, whose edges rapidly assumed a bluish-green color, discharged nasty green pus. Gangrene developed

in the skin of the prepuce and penis, which exfoliated and healed with production of cicatrices.

The prognosis also depends materially upon the conduct of the patient. This furnishes an important reason for caution, even in simple cases, and for calling the attention of the patient to the possible dangers of an imprudence.

Anatomy.

Like the obscure etiological views on blenorrhœa, the notions concerning its nature and situation were also very obscure. The imperfect opportunities for making autopsies were an important factor in producing this state of affairs.

The oldest appellation of the disease *viz.*, gonorrhœa (flow of semen, from γονη, seed, and ῥεω, to flow), showed that the ancients identified the secretion of blenorrhœa with semen. But this opinion was not accepted universally, and, as we have seen, the nature of the secretion as pus was soon recognized and the process regarded as inflammatory. From this period the disease was regarded as much more serious than it really is. There was talk of ulcerations of the urethra. The views concerning the nature of the discharge also varied, and these uncertainties and essentially different opinions persisted until the middle of the eighteenth century.

Thus, Sydenham (1680) regarded clap as an inflammation of the spongy substance of the penis, which gradually passes into suppuration. The pus is then deposited in the urethra and slowly escapes, as is seen in clap and spermatorrhœa. Zeller (1700), Warren (1710), Littré (1711), Astruc (1754) place the site of clap in Cowper's glands, the prostate, and seminal vesicles, and attribute it to suppuration and ulceration of these glands. This opinion is explained by the fact that the few autopsies made by these writers were performed on individuals suffering from old, neglected clap, accompanied by strictures and severe retro-strictural changes and ulcerations. The observations made in these cases were then generalized.

The few writers who, favored by fortune, had the opportunity of examining recent urethritides post-mortem, soon adopted another view. Thus, Laurentius Terraneus (1703) had the opportunity of making six autopsies on recent cases, in one of which, urethra omnino inflammatione livescebat, glandulæ-

que disgregatæ immodicum extumebant. Terraneus therefore explains blenorrhœa as an inflammation of the entire mucous membrane, whose surface produces the discharge. Cockburne (1717) expressed the same opinion soon afterwards.

But the view that there were severe ulcerative changes in the urethra still remained the prevailing one. This descended to Morgagni, who, in 1745, introduced his divergent views in the following words: Etsi pauci forte sint Anatomici a quibus tot fuerint, quod a me, urethræ viriles dissecatæ, et diligenter perlustratæ; tamen aut rarius quam vulgo existimant, luculentiora in eo canali vitia occurrunt quæ contagiosam Gonorrhœam comitentur, aut nescio quo casu factum est, ut cum magnus hominum hac infectorum sit numerus, illa ego vitia tam luculenta vix unquam aut ne vix quidem conspexerim. Morgagni then passes to the description of his findings, which included merely slight redness, increased moisture of the urethral mucous membrane, but complete intactness, or at least no severe ulcerations, in the urethra, prostate or seminal vesicles. It is also an interesting observation of Morgagni (which was corroborated one hundred years later by Virchow) that the pus corpuscles of clap are larger than those found in other forms of pus, but Morgagni could not make up his mind to call the discharge of clap true pus, and adopted Rondelet's term materia puriformis.

In 1753 Hunter had the opportunity of examining two hanged criminals who had been suffering from clap. In neither did he find ulcerations of the urethra, but the mucous membrane, especially within the glans, was very much reddened. In subsequent autopsies Hunter found a similar condition of the urethra.

In 1777 Stoll had the opportunity of examining the genitalia post-mortem. Greenish pus escaped from the urethra, and the meatus appeared reddened. The mucous membrane of the urethra was swollen for two fingers' breadths from the meatus and also in the bulb; in the place of Morgagni's lacunæ were found a large number of whitish specks and dots.

Gendrin (quoted by Gibert, 1836) describes the following findings: a soldier, vigorous and robust, suffered, in consequence of neglect of a blenorrhœa of ten days' standing, from retention of urine and fever. The catheter discharged foul-smelling urine. Fatal termination after severe general symp-

toms. The autopsy showed swelling of the walls of the bladder and several ulcerations in its mucous membrane. The vesical peritoneum was inflamed. The entire urethral mucous membrane had a livid color and was swollen; in the bulb an ulcer as large as a 50 centime piece involved the entire circumference of the canal, and there were two others, with a diameter of about two lines, one in the middle of the pendulous portion, a second next to the prostate.

Lisfranc (1815) states that he made many autopsies on individuals suffering from blenorrhœa and who had died of adynamic fever. He claimed to have found ulcerations of the diseased mucous membrane quite frequently. According to his investigations the disease begins in the fossa navicularis, extends about the twelfth day to the bulb, and about the twentieth day to the membranous portion.

Cullerier secured only one autopsy on a case of acute urethritis in twenty years, and found two markedly injected patches in the region of the fossa navicularis and pars membranacea, which were connected with one another by stripes of inflammatory redness.

Boyer (1836) found, in one case, merely inflammatory redness of the pendulous portion.

Friedberg (1865) describes the following appearances at the autopsy of a boy of sixteen years, who had suffered from clap for four weeks, and died as the result of an injury to the head. The urethra contained quite consistent, greenish-yellow, purulent secretion. The mucous membrane was moderately swollen in the fossa navicularis and of a dull, dark-red color. Much more vivid injection was found in the pendulous portion of the urethra and extended about 2″ into the pars prostatica. The posterior wall of the pars membranacea projected distinctly and narrowed the lumen of the canal in a striking degree. The projection was caused by an extravasation of blood, which apparently started from the very vascular cellular tissue surrounding the mucous membrane, inasmuch as the hemorrhage lay not alone between the mucous membrane and the connective-tissue envelope, but also between the latter and the circular muscular stratum of the urethra. An extensive ulcer was situated here on the posterior wall of the mucous membrane, and its soft, here and there eroded edges ran an irregular course and remained at the level of surrounding parts. The

ulcer was covered by laudable pus, which could be readily washed off. The base of the ulcer showed partly necrotic, partly granulating tissue. In the immediate vicinity of the edges it only included the surface of the mucous membrane, while it involved the deeper layers toward the centre. A few of Littré's glands were distinctly swollen on the left side of the upper border of the ulcer. Cowper's gland on the right side was swollen to the size of a large pea and contained a yellow, tough, consistent, muco-purulent secretion. The opening of the gland lay in the ulcer and was occluded by a firm clot; the inner wall of the gland was strongly injected.

Voillemier (1868) had the opportunity, in the course of thirteen years, of attending nine autopsies on individuals suffering from blenorrhœa, and gave accurate reports. The fifth case is the most interesting. A young man, æt. twenty-four years, died from a railway injury, while suffering from a first attack of urethritis of nine days' standing. The urethral mucous membrane appeared somewhat contracted. It was swollen and reddened over a surface extending 7 cm. from the orifice, the openings of Morgagni's lacunæ were distinctly visible and the mucous membrane thus appeared as if strewn with fine openings. In the median line of the canal, 4 cm. from the meatus, a lacuna Morgagni was depressed, the surrounding parts destitute of epithelium, and as a result a superficial ulcer, 3 mm. long, 2 mm. broad, had formed. On compression of the mucous membrane greenish-yellow pus escaped from the openings of Morgagni's lacunæ.

A. Guérin (1854) reports the following autopsy: the penis was enlarged and œdematous, the swollen prepuce covered the glans, and abundant creamy pus could be expressed from the urethra. The mucous membrane is moderately reddened, Morgagni's follicles distended, and pus could be squeezed out of the latter. On section of several follicles they were found dilated into sacs, which extended almost 1 cm. into the urethral walls. The tissue of the bulb is filled with blood, the meshes near the mucous membrane contain clots similar to those found in veins. The trabeculæ are soft and yielding.

Murchison (1875) describes a case in which the patient died of blenorrhagic cystitis and nephritis, and the autopsy showed redness and swelling of the entire urethral mucous membrane.

In order to complete the anatomo-pathological history of

acute urethritis, we will here describe the endoscopic appearances.

Desormeaux (1865) describes acute blenorrhœa as intense redness and swelling of the urethral mucous membrane, whose surface is uneven and covered with erosions. When the process is about a week old, it extends to the middle of the pars pendula. When it becomes older, the anterior parts resume the normal appearance while the deeper parts become affected.

Gruenfeld (1877) described the urethral mucous membrane as swollen, ridged, of a dark-red to bluish-red color, the surface smooth and superficial epithelial losses noticeable here and there. The mucous membrane bleeds readily on contact.

We will now make a *resumé* of the picture of acute urethritis resulting from these examinations.

It constitutes an inflammation of the mucous membrane and submucous tissue with all its characteristics, such as redness and swelling and secretion of a mucous, muco-purulent or purulent discharge. The intensity of the inflammation will vary, and hence the mucous membrane presents different appearances. Sometimes the swelling will be slight and the injection dendritic, sometimes the redness and swelling will be very marked. The glands and follicles always appear to be affected early and intensely. They become swollen, their openings gape in the shape of a funnel. The inflammation also extends to the lumen of the glands, and even the parenchyma takes part in the inflammation and the production of morbid secretion. If the lumen of the gland or follicle is now occluded by a firm plug of mucus or pus, retention of pus and the formation of cysts result, as in Guérin's case. Desquamation of the epithelium and superficial losses of substance also take place at the mouth of the follicle, and if the process is severe may lead to small ulcerations (clap ulcers). Deeper ulcers may also develop, perhaps, from the rupture of one or more cysts due to occlusion of the gland openings. This early and intense implication of the glands explains the obstinacy of clap and its tendency to relapse. The latter is due to the persistence of the process, which has died out on the surface, in one or more glands, where the virus increases and may then be discharged upon the surface; perhaps because the secretion of the virus is increased by local and general irritating influences, such as coitus and excesses in Baccho.

The corpus cavernosum is also implicated in the more severe cases, its trabeculæ are swollen and more succulent, the erectile tissue is richer in blood, its meshes plugged by clots of fibrin in parts of the peripheral layers.

Rokitansky makes the following statements concerning blenorrhagia: The catarrhal inflammation of the urethral mucous membrane as clap has a tendency to run a chronic course. It is either distributed quite uniformly over the urethra or it is very often confined to one or more places, either originally or in its subsequent course. Such spots are found everywhere up to the pars prostatica, but most frequently near the bulb and in the fossa navicularis. They are manifested by dark redness and swelling, occasionally (particularly in the fossa navicularis) by striking swelling of the mucous glands and formation of pus. The corpus spongiosum at these places (mainly in the inner layers, but sometimes in its entire thickness) is swollen, the size of its meshes is diminished, and it therefore contains less blood. This gives rise to a resisting ridge which is visible in the urethra.

Although we are well informed concerning the macroscopical changes in blenorrhœa, we know hardly anything of the finer microscopical changes, particularly concerning the situation and distribution of the gonococci.

Jullien (1886) adopted the unproven theory that the blenorrhagic process occurs chiefly in the lymph channels; he divided mucous membranes into those which are susceptible to blenorrhœa (with pavement epithelium, no papillæ and a high network of sub-epithelial lymphatics), and those which are not susceptible (with cylindrical epithelium and a high vascular network).

It is true that Bumm (1886) and Gersheim (1888) assume that gonococci are only able to enter mucous membranes with cylindrical epithelium and that pavement epithelium constitutes a complete obstacle to their immigration. Toulon (1889) disputes this statement, for the reason that he observed immigration of gonococci between the pavement epithelium in gonorrhœal præputial folliculitis, and he regards their entrance as dependent only on the width of interepithelial juice spaces. Toulon's findings were confirmed by Jadassohn (1890) and Fabry (1891). In 1887, Dinkler had noticed the entrance of gonococci into the pavement epithelium of the cornea.

Bockhart's (1883) previously mentioned case has not alone been the subject of attack with regard to its etiology, but the histological appearances also present certain peculiarities. Thus, the statement that the gonococci were situated in the nuclei of the migratory cells is entirely opposed to what is seen in blenorrhagic pus; and the pictures and descriptions of transverse sections of lymphatics filled with heaps of gonococci are so similar to Ehrlich's mast cells, that we must think of a mistake between the two, especially as no mention is made of mast cells, which are hardly ever absent in a specific inflammation.

A partial substitute for the lacking histological details of blenorrhœa urethræ is afforded by Bumm's (1886) investigations on blenorrhœa conjunctivæ neonatorum.

According to Bumm the process in blenorrhagia, the combat between gonococci and the inflammatory products which endeavor to eliminate them, occurs in the following way: The infecting secretion conveys a certain number of gonococci to the mucous membrane. These penetrate the layer of epithelial cells and reach the papillary body of the mucous membrane, passing through and between the protoplasm and cement substance of the epithelial elements. Swarms of white blood globules emigrate at this time from the dilated capillary network which extends almost to the epithelial covering; they penetrate into the upper strata of the connective tissue, whence, laden with gonococci, they pass through the epithelium to the surface. The epithelial stratum, whose firmness is destroyed by the proliferation of cocci, is fissured by the stream of fluid accompanying them, and raised in clumps; this may be aided by capillary hemorrhages between the epithelium and cellular tissue.

The distribution of the cocci is confined to the superficial layers of the sub-epithelial cellular tissue, where they are arranged between the fibres in rows or round colonies. While the micro-organisms increase in this manner in the outermost layers of the connective tissue, the inflammatory symptoms increase in intensity, and the round-cell infiltration finally occupies the entire papillary body, cell being closely applied to cell. This furnishes the transition to the purulent stage, in which the majority of the gonococci are washed away by the abundant suppuration. After a variable time regeneration

begins from the remains of the original epithelium, and by its extension puts an end to the further spread of the cocci in the tissues, while the migration of the pus cells, which carry off the remainder of the cocci, proceeds uninterruptedly. With the regeneration of the epithelium are usually associated proliferating processes, from the lowermost layers of which epithelial papillæ grow into the connective tissue substratum. At this time the cocci have disappeared, with the aid of the pus cells, from the papillary bodies, and are only found in the upper layers of the epithelial covering. But if the fresh epithelial covering cannot withstand an irruption of migrating round cells, induced by external irritants, its continuity will suffer and a new invasion of the papillary body with cocci will take place, *i.e.*, a relapse occurs. During the latter part of the purulent stage and the entire muco-purulent stage the proliferation of gonococci takes place outside of the tissues, upon the surface of the epithelium and in the secretion.

This description now requires certain corrections. Based upon Metschnikoff's theory it ascribes phagocytic power to the leucocytes, and assumes that deep down in the epithelium and in the upper layers of the papillary body the gonococci are incorporated by the active agency of the leucocytes and are carried to the surface. But Metschnikoff's theory is constantly encountering more and more opposition.

Thus, Bumm (1889) himself claimed that the dense filling of many leucocytes with gonococci, the regular grouping in the plasma (which permitted the inference of intracellular proliferation) warranted us in inferring the penetration of the gonococci into the cells, intracellular proliferation, destruction of the cells, *i.e.*, processes in which the gonococci play an active, the cells a passive part. Orcel (1887) has also shown that the union of the gonococci and cells takes place upon the free surface. After the pus of acute urethritis was removed by micturition and irrigation, he scraped the mucous membrane with horn curettes and found that the gonococci were always free. Neisser (1889) also agrees in this opinion. In opposition to Bumm's theory that the gonococci rapidly penetrate the epithelium and proliferate in the upper layers of the connective tissue, the opinion is beginning to prevail that the gonococci long remain upon the surface and proliferate exclusively upon and between

the upper layers of epithelium. This opinion is based upon a series of anatomical findings. These include the investigations of Toulon (1889), Jadassohn (1890), and Fabry (1891) on gonorrhœal para-urethritis, those of Rosinski (1891) on gonorrhœal aphthæ, and those of Toulon (1893) on gonorrhœal Bartholinitis. In all these cases—and I have convinced myself of the correctness of the findings by examination of several para-urethral gonorrhœas—the gonococci proliferate exclusively upon the surface of the pavement epithelium, form patches upon their uppermost layer, which appear on cross section as pairs of cocci arranged in a row alongside of one another. It is only in the interepithelial spaces that they penetrate between the cells into the deeper epithelial layers, and are here arranged behind one another; it is only in certain interepithelial spaces that they are arranged in small groups. According to Rosinski they penetrate most deeply into the epithelium in the buccal mucous membrane. They are never found in the connective tissue. We must not forget, however, that we have to deal here with tissues of an essentially different structure from that of the urethra. The epithelium, which is usually a pavement epithelium of many layers, is very different from that of the urethra, which consists of a layer of cylindrical epithelium and one or two layers of transition epithelium.

In fact, Bumm's findings differ essentially from those just mentioned. Frisch's investigations (1892) on rectal gonorrhœa do not coincide with those of gonorrhœal para-urethritis. In gonorrhœal conjunctivitis Bumm noticed rapid penetration of the epithelium and the presence of gonococci in the upper layers of the connective tissne. In his cases of rectal gonorrhœa, Frisch found gonorrhœa in the glands, the periglandular connective tissue, and the entire mucosa as far as the muscular coat. Finally, Wertheim (1892) found, on inoculation of gonococci cultures into the peritoneum, that they entered the connective tissue as far as the muscular coat inside of twenty-four hours.

The conjunctiva and rectum possess much more anatomical similarity to the urethra than the latter does to the buccal mucous membrane and the para-urethral canals. So long as we are confined to inferences from analogy, it appears much more probable that the gonococci exhibit analogous conditions

to the conjunctiva and rectum, so far as regards their entrance and distribution. Anatomical investigations of gonorrhœal urethritis are still lacking. I have recently begun such investigations in Prof. Weichselbaum's Institute, but they are not yet concluded. I may here mention that in two cases, in which I examined the urethra thirty-eight hours and forty hours after infection, there was abundant infiltration of the epithelium and subepithelial connective tissue with leucocytes. Gonococci were found in small masses upon the surface of the cylindrical epithelium, but were especially numerous and often very deep in the lacunæ and excretory ducts of Littré's glands. Their entrance into the connective tissue and penetration of the epithelium were not found at this early stage.

The following facts prove, however, that in many cases gonococci soon penetrate the epithelium and enter the connective tissue.

In the first place Pelizzarri (1890) proved that para-urethral abscesses may be owing to gonococci. These abscesses are by no means rare in blenorrhœas which have not yet passed the second week since infection.

Crippa (1893) has recently published two interesting cases from my hospital clinic, which belong to this category. Two patients came under observation, a week after infection, with the symptoms of acute blenorrhœa and œdema of the remainder of the circumcised præpuce in the vicinity of the frænulum and fossa navicularis. After careful cleansing I punctured and evacuated the œdema fluid. This contained gonococci, which were partly free, partly inclosed in the scanty leucocytes. Hence the gonococci had penetrated deeply into the subepithelial connective tissue a week after infection.

In one case the gonococci were also found within leucocytes. Toulon (1889), Fabry (1891), and Frisch (1892) have also found pus cells laden with gonococci in sections of para-urethral and rectal gonorrhœa. This proves that the union of leucocytes and gonococci may take place in the tissues, and that the view of Orcel and Neisser does not always hold good.

Treatment.

There is hardly a branch of medicine which is so rich and in which so many and opposing recommendations, remedies

and methods have been employed, as in the treatment of clap. Nevertheless, perhaps on account of this very fact, the treatment of the disease is one of the most thankless tasks in medicine.

Not alone do external social conditions, the necessity for concealment, often impair the therapeutic results, and make the hygienic-dietetic prescriptions illusory, but the struggle with the patient which the physician must undertake in order to keep the most powerful of all senses, the sexual sense, within the bounds necessary for recovery—a battle in which the physician often succumbs—and the routine manner of treatment, are in great part at fault in the numerous bad results. So long as no change occurs in these respects, progress cannot be expected, and in addition to the complications a large percentage of chronic urethritides must be attributed to the fault of the physician. So long as the physician regards every drop of pus at the meatus as synonymous with blenorrhœa and at once orders one of the usual injections with a clap syringe in a "purely reflex" manner, so long will the cure of blenorrhœa remain an accident, which occurs despite the physician and not on account of his treatment. Thanks to the profession the matter has gone so far that many patients who suffer from urethritis visit the nearest apothecary in order to buy a solution of zinc for injection, because they know that the physician will order nothing else.

A positive diagnosis, accurate localization, gauging of the intensity of the symptoms and then precise directions according to certain indications are the only methods of effecting sure curative results.

We have already said all that is necessary in regard to diagnosis. But I would like to emphasize the remark that, before beginning treatment, the conscientious physician should convince himself of the nature of the disease and examine for gonococci.

The second important question is the extent of the inflammation, whether we have to deal with simple anterior urethritis or whether this is complicated with posterior urethritis, inasmuch as the treatment is essentially different in the two cases.

Our anatomical studies have shown that the firm contraction of the compressor urethræ will make it impossible for fluids

to pass from the pars anterior to the pars posterior. The ordinary method of injection with a clap syringe therefore carries the fluid into the pars anterior alone, and is useless in the treatment of posterior urethritis.

Indeed, these injections are positively injurious in posterior urethritis. It is well known that, when urethritis is complicated by cystitis, epididymitis, prostatitis, even a very mild astringent injection into the urethra increases the intensity of the complicating inflammation. But posterior urethritis is merely a complication of anterior urethritis and will also be aggravated by such treatment. Every physician who favors the routine treatment of every urethral suppuration with mild injections, will remember cases in practice in which the first injection was followed by some complication, usually epididymitis. Milton (1876) called special attention to this circumstance. Bad syringes, awkwardness in making the injection, carelessness of the apothecary in making the fluid stronger than ordered, these are the reasons given by the physician to the patient in explanation of the mishap. But probably the patient is right in attributing the exacerbation to the physician, inasmuch as a careful examination would have prevented the failure to recognize the posterior urethritis, which was intensified by the improper injection.

The acuteness of the process must also be considered in every case. But localization is also important in this respect because, if a complicating posterior urethritis is present, we know that we have to deal with two processes of unequal acuteness, and that those topical remedies which will diminish the inflammation if the latter is moderate, will increase it, on the other hand, if the inflammation is intense.

We will first consider the possibility and methods of preventing blenorrhagic infection, then the hygiene and diet of the patients, the individual anti-blenorrhagics, and finally the methods and indications for their employment.

Prophylaxis.—As a matter of course, the surest prophylactic measure against blenorrhagic infection is to avoid exposure. The small statistics furnished in considering infection show in which cases the danger of infection is greatest. But our social conditions make extra-marital coitus necessary for a large number of young people, and the question thus arises whether there is any means of preventing infection despite exposure.

We have previously mentioned the factors which favor infection, and their avoidance alone constitutes a form of prophylaxis. In suspicious cases coitus should be performed rapidly, without previous protracted excitement, and repetition of the act should be avoided. This does not prevent infection absolutely, because the introduction of the virus is still possible. Measures were therefore sought which would destroy the virus adherent to the glans or that had penetrated into the urethra. One of the oldest and most rational, *viz.*, urination after coitus and washing of the glans with urine, was recommended by Johann de Gaddesden, Fallopius, Palmarius and Harrison. Guillelmus de Saliceto, Lanfrancus and Almenar mention washes of wine or vinegar. Torella thought the most certain means was the suction of the virus by other individuals. Magnardus recommended orange-blossom water for the rich, water in which iron had been cooled for the poor. Brassavolus and Boerhave suggested simple washes of cold water. Hieronymus Montuus recommends that a freshly killed hen or frog be cut in two and applied to the penis. Ettmueller advised washes of turpentine and wine. Cataneus, Falk, Preval, Hunter and Spangenberg recommended corrosive sublimate and gray ointment. Warren, Peyrilhe, Oesterlen mention alkaline washes and injections, and Hausmann (1886) has recently advised injections of a two per cent. solution of nitrate of silver.

All these chemical agents are uncertain, because it is doubtful whether they can kill the virus or whether they even come in contact with it. Mechanical means are, therefore, more certain and useful. Condom, an Englishman, prepared covers, made of the cæcum of lambs, and rubbed with bran and almond oil, which were drawn over the penis during coitus. The inventor, who is said to have lived in England in the time of Charles II., obtained little honor from his discovery. He was so universally scorned and ridiculed that he was forced to change his name. But the covers devised by him have transmitted his name to a grateful posterity and are in general use at the present time under the name of condoms. When impermeable and uninjured during coitus they furnish a greater safeguard than all chemical prophylactic measures. Unfortunately they are abused, and infection has been known to occur from previously used and insufficiently cleaned condoms, which were resold by prostitutes or dealers.

Hygiene, Diet.—After blenorrhœa has developed, the physician has two objects in view—to keep at a distance all factors which affect the course of the disease unfavorably, and to adopt curative and palliative measures.

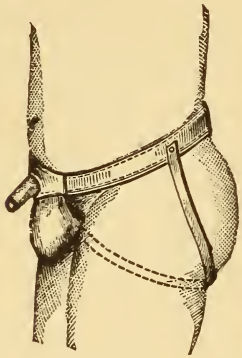


Fig. 4.

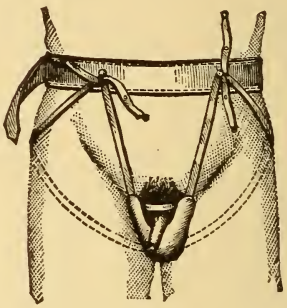


Fig. 5.

The first object is attained by regulation of the hygienic and dietetic conditions.

This should not be regarded as trivial. In many cases, particularly in a first attack of anterior urethritis, strict regulation of these conditions would suffice to secure a rapid and

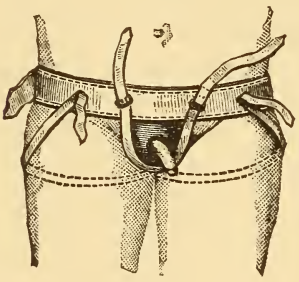


Fig. 6.

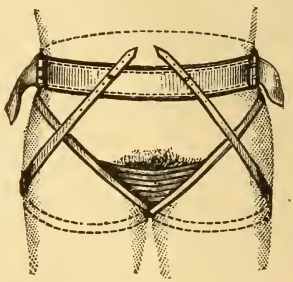


Fig. 7.

favorable termination, as we can convince ourselves, particularly in hospital patients. Unfortunately not many patients, and least of all those in the better classes, are able to carry out such instructions strictly. For example rest in bed can hardly ever be secured. At all events all forced movements,

such as running, gymnastics, dancing, exhausting and long-continued walks, should be prohibited. All violent passive movements, such as riding, driving, particularly on bad roads or in heavy wagons without springs, are equally injurious. Travelling on the railroad, with its slighter oscillating movements, is less harmful. In all cases we should recommend the wearing of a good suspensory. This is intended to elevate the external genitals, penis and scrotum without exerting pressure on them, to fix them against the lower part of the abdomen, and thus prevent the shaking which increases the inflammation. The number of suspensories is very great. All are serviceable which exercise uniform pressure and traction, *i.e.*, those which not alone raise the external genitals, but also draw them against the body, the former by traction against the waist-band, the latter by traction against the perineum (Fig. 4). A good suspensory therefore possesses a waist-band, and perineal or thigh straps, as in those of Kohn, Neisser (Fig. 5), Ihle (Fig. 6), Unna (Fig. 7). Those are bad which, like ordinary riding suspensories, simply raise the genitals, but leave this in the hands of the patient. By drawing too strongly on the straps the genitals are raised too far, and permanent compression of the perineal portion of the urethra results. This irritates the canal and is apt to cause stasis of the secretion.

That coitus is to be forbidden is clear to the physician, but not always to the patient. Sexual excitement, resulting from lascivious thoughts, pictures, books, plays, and exciting female society, are also to be avoided. But the abstinence and the increased sexual irritability due to the blenorrhœa produce great sexual excitement despite the will of the patient. This is manifested by frequent erections and pollutions, which are extremely injurious. They should be combated by a cool, hard bed, regular evacuations from the bowels, and the use of antaphrodisiacs. Camphor, lupulin, potassium bromide and sodium bromide are useful. Camphor is also recommended externally, strewn upon cotton in the suspensory. The internal administration is preferable.

℞ Camphoræ rasæ, ... gr. iij.
Mixt. gummosæ, ... ʒ iij.
S. 1 teaspoonful every 2 hours.

Lupulin and the bromides are always given internally. We prescribe the following:

℞ Lupulini pur., ... gr. xv.
Morphiæ muriat., ... gr. ¾.
Sacch. alb., ... gr. xxx.
M. f. pulv., div. in dos. x.
S. 3 powders daily.

℞ Lupulini pur., ... gr. xv.
Sacch. alb., ... gr. xxx.
M. f. pulv., div. in dos. x.
S. 3 powders daily.

℞ Lupulini, ... gr. xv.
Camphoræ, ... gr. iss.
Extr. lupuli q. s. f. pill. x.
S. 6 pills daily.

The bromides are given morning and evening in gr. xv.–xxx. doses, but the following prescriptions are the most useful.

R. Natri. bromat., ... ʒ iiss.–iv.
Camphor ras.,
Lupulin, ... āā gr. vij.–xxij.
Mf. pulv. div. in dos. x.
Put in waxed papers.
S. 1 powder morning and evening.

℞ Camphor. monobromat., ... ʒ i.
Div. in dos. x.
Put in capsules.
S. 3 to 4 capsules daily.

Antipyrin in doses of 15 to 30 grains is also recommended as an antaphrodisiac.

Attention must also be paid to diet. Everything is to be avoided that makes digestion slow, causes constipation, irritates the genitalia directly and increases the inflammation.

As regards the first point, all articles heavy of digestion, such as puddings, rice, cheese, are to be avoided. Food seasoned with pepper, and curry, asparagus, highly salted and acid articles are stimulating and exciting. Very hearty, nutritious food acts the same way.

The fluids require special consideration. The close relationship of Venus and Bacchus is known not only in mythology. Carbonated drinks are especially to be avoided (champagne, beer, acid waters, such as soda water, Selters, Preblauer, Geisshuebler, etc.). This is also true of heavy Italian, Spanish and English wines. It is best to forbid all alcoholic drinks. In many patients this command is shipwrecked on the cliff of secrecy. Now, I have always observed that after prolonged and complete abstinence even small amounts of alcohol are injurious, but that the bad effects are slight if the patient from the start accustoms his clap, I might say, to a moderate amount of alcohol and does not exceed this quantity. I therefore allow my patients from the beginning to take daily the same amount of light red wine.

Many patients ask us concerning smoking. Bumstead (1883) regards it as injurious. It is true that those unaccustomed to smoking are sexually excited by it, but this is not true of habitual smokers. I therefore believe that it should not be absolutely interdicted.

The attention of every patient should be called to the danger of conveying the clap secretion to the eyes. Great care and cleanliness are indicated. It is best to allow him to wear some cotton in the præputial sac, which absorbs the discharge, and prevents soiling of the clothes; this should be frequently changed. Or the patient wears, attached to his suspensory and over the penis, a little bag which receives the discharge. Washing the hands after every manipulation of the genitals is strictly necessary.

These are, in brief, the hygienic and dietetic rules, which the physician must adapt to each individual case. Thus, if there is deficiency rather than excess of sexual excitement, sedative treatment must be abandoned, in weak individuals tonic treatment is indicated, and the withdrawal of nourishing, easily digested food is out of place.

Oversight of the Remedies.

The most ancient theory concerning clap was that we had to deal with the secretion of increased and spoiled semen. Hence remedies were prescribed which were supposed to diminish the production of semen, such as semen et folia rutæ, nux pineæ, semen anethi, lactuca, semina cannabis, plantago, origanum, etc.

The conviction (which soon gained sway) that clap was an inflammatory process, and the discharge the result of ulceration of the urethra and bladder, led to topical treatment, sometimes to the most fantastic recommendations. Sedative and cooling remedies, such as milk, whey, barley water, honey, and diluted vinegar, were used for injections. Very peculiar measures also appeared. Thus, we read in Hercules Saxonis (1597): "Sciendum autem est, quod habui a quibusdam Venetis; dicunt, se a gonorrhœa statim curatos usu Veneris cum muliere Æthiope. Haec quoque scio, antiqua gonorrhœa plures fuisse liberatos, qui cum uxore, virgine rem habuere, sed tunc mulier inficitur." In the Richard manuscript of the thirteenth century discovered by Littré we read "Et nota, quod in magno dolore et tumore prodest, si in muliere diu, quando in coitu, moretur; vulva enim sugendo, mollificando et quasi purgando dolorem minuit et saniem attrahit."

When the theory of the syphilitic nature of clap was promulgated in the second half of the sixteenth century, the disease was subjected to antisyphilitic treatment, mercury, guaiac, sarsaparilla in large doses and drastic purgatives.

The change in the etiological views at the beginning of this century caused a change in treatment, and clap, recognized as a local disease, was treated locally. Some of the remedies were empirical, others, like the astringents, belonged to the group of antiphlogistics.

Advances in therapeutics might have been expected from the most recent investigations in etiology, especially from the discovery of the gonococcus. Unfortunately these expectations were not fulfilled. A few writers have made pure cultures of the gonococcus, and studied the effect of various remedies on contagiousness, growth and vital conditions, but these laborious investigations have hitherto had no practical value. These investigations do not always show clearly that the writers really experimented with the gonococcus, and then the growth of the cocci upon our artificial nutrient medium is so precarious and easily disturbed, that we cannot infer that those doses and remedies which prevent the growth of the pure culture, will have a similar or approximately similar effect upon the development on the good soil of the urethral mucous membrane. Until we possess an artificial nutrient medium which

offers the gonococci the same favorable conditions as the urethral mucous membrane, we can arrive at no conclusion on this question. But it cannot be held that the discovery of the gonococci has been entirely valueless as regards treatment. They furnish us with positive knowledge concerning two therapeutically important data—the diagnosis and the virulence of the secretion, the duration of treatment.

Friedheim (1889) and Neisser (1889) have recently recommended nitrate of silver as a direct antibacterial remedy, but we do not agree unqualifiedly with their conclusions. Neisser mentions the following conditions of rational treatment: 1, the remedy must kill the gonococci; 2, it should not injure the mucous membrane; 3, it should not increase the inflammation. Nitrate of silver does not meet all these indications. According to Jerosch (1889) the drug, in solutions of 1:1000, kills the germ in two to three minutes, but this only holds good of cultures. Like corrosive sublimate, it is decomposed by pus and blood and loses much of its efficacy. Thus, Jerosch states that, on admixture with serum, 2 per cent. solutions must act for five minutes before they are really parasiticide. Moreover, it is probable that different germs will react differently to nitrate of silver. Thus, Oppenheimer's supposed cultures of gonococci were only affected by 2 per cent. solutions of nitrate of silver. Although this drug will not produce lesions of the mucous membrane, it is a powerful irritant. Even in weak solutions (1:2000 to 1000) which are no longer positively parasiticide, the mucous membrane is irritated to such an extent that I do not regard its application as advisable in recent blenorrhœas. Ammonium sulfoichthyolium, recommended by Koester (1890), and Jadassohn (1892), is more serviceable because less irritating, although it is not a perfectly reliable parasiticide.

Corresponding to the local nature of the process, all our remedies are local, and differ only in so far as the topical action is effected, in one group, indirectly by internal administration, directly, in the other, by topical application. The internal remedies belong to the category of balsams and ethereal oils, or they are alkaloids, or finally mineral substances, particularly alkalies.

The ethereal oils and balsams occupy the most prominent

place. This is particularly true of copaiba balsam, derived from various leguminosæ of the species copaifera, particularly copaifera officinalis and guyanensis. It forms a thick, light to brownish yellow, clear, sticky mass like thickened oil, with a peculiar resinous odor and a bad taste. It was first given internally by Markgraf and Pison (1648) and introduced into the treatment of venereal diseases by Daniel Turner (1729) and J. Thorn (1827). It is given in doses of 15 to 20 drops on sugar. Unfortunately the nauseous taste is then very pronounced, and the attempt was therefore made to conceal this or to give it in another form. From the desire to conceal the bad taste sprang Chopart's potion, which is still used in France:

℞ Balsami copaivæ,
Spir. vin. rectific.,
Syr. tolutan.,
Aq. menthæ,
Aq. naphæ, ... āā ℥ ij.
Spirit nitric, ... ʒ ij.
S. 3 to 6 tablespoonfuls daily.

Ricord modified and simplified this prescription:

℞ Balsami copaivæ,
Syr. diacodii,
Syr. tolutan., ... āā ℥ j.
Aq. menthæ, ... ℥ ij.
Aq. naphæ, ... ʒ iiss.
Gummi arabic q. s. f. emulsion
S. 3 to 9 tablespoonfuls daily.

The following similar mixtures are used frequently:

℞ Bals. copaiv., ... ℥ j.
Spirit. nitric., ... ʒ ij.
Tinct. opii spl., ... gtt xxx.
S. 20 drops 2 to 4 times daily.

℞ Bals. copaiv., ... ʒ iij.
Vitell. ovi tria c. aq. fontis, . . . ℥ v.
Aq. cinnamon., ... ℥ j.
Syr. cinnamon., ... ℥ ss.
S. 1 tablespoonful every 3 hours.

The bad taste of these mixtures induced Lagneau and Velpeau to administer the balsam in enemata.

℞ Bals. copaiv., ... ℥ ss.
Vitelli ovi I.
Extr. opii aq. . . . . gtt. j.
Decoct. sem. lini. . . . . ℥ vj.
S. For one enema.

Wehner prescribed the remedy in suppositories:

℞ Bals. copaiv., ... ℥ v.
Pulv. opii, ... gr. iv.
Butyr. cacao,
Spermaceti, ... āā ℥ iss.
Ceræ alb., ... gr. xlv.
F. supposit. No. xii.
S. One suppository morning and evening.

All these, in part impracticable, methods of administration, became superfluous when Favrot and Mothe began the use of gelatine capsules, filled with 5 to 10 drops of the balsam, permitting its entrance into the stomach without its nauseating effect. The copaiba is given in this way at the present time, 3 to 6 capsules being taken daily.

Ricord (1849) and Roquelle (1854) showed that it merely acts locally, by passing into the urine. The latter, saturated with the balsam or its disassimilative products, passes through the urethra, and thus produces its action. Both these writers treated clap patients who suffered from urethral fistula, with copaiba internally. The portion of the urethra situated behind the fistula, and which was constantly washed by the urine, recovered, the portion in front of the fistula remained blenorrhagic and did not heal until injections of the patient's urine were made into it. Ricord then administered copaiba to a patient in his clinic who was not suffering from blenorrhœa, and injected a few clap patients with his urine. This urine proved effective, a distinct evidence of the topical action of the balsam. Weickart (1860) first studied the form in which the copaiba enters the urine. He showed that the resinous acid, the copaivic acid, unites in the circulation with the alkalies, and this enters the urine dissolved as sodium copaivate.

In addition the urine contains the ethereal oil, which gives it the peculiar odor of violets. If a mineral acid is added to urine containing sodium copaivate in solution, a whitish flocculent precipitate, very similar to albumin, is obtained. This precipitate induced many observers to really suspect albuminuria and led to the statement that the balsam may give rise to nephritis, an accusation which was repeated in 1872 by Tarnowsky. The precipitate consists of the copaivic acid, which is freed by the mineral acid from its combination with the soda, and is soluble in an excess of the acid. Rocco da Luca and Amato (1884) have studied the action of copaivic acid and oil of copaiba on blenorrhœa, and have come to the conclusion that neither of these constituents separately has the same effect as their combination in the balsam. Like Quincke (1883) they showed that, on the administration of the pure oil, this passes into the urine as an easily decomposed salt. On the addition of mineral acids to such urine the acid is set free and imparts a purplish-red color, which Quincke calls copaiba red.

Unfortunately copaiba sometimes produces certain incidental effects which interfere with its administration or render this impossible. Thus, it is absorbed with difficulty, produces indigestion after protracted use, and this may increase to severe gastro-intestinal catarrh, unless care is exercised. Less important, but very alarming to the patient, are the phenomena on the integument, which sometimes develop after the first dose. These consist of eruptions, belonging to the class of angioneuroses, such as erythema or roseola, a papular erythema, or, more rarely, urticaria or purpura. The most frequent of these polymorphous eruptions are patches of circumscribed redness, whose color may also vary from dark violet to yellow; they become confluent, their size changes rapidly and they usually disappear rapidly without subjective symptoms. In many cases the first dose alone is followed by the eruption, which disappears despite the continuance of the medication; in other cases the eruption increases with the further administration. If the eruption is an urticaria, gastric disturbances and pruritus are usually present. The symptoms generally disappear spontaneously as soon as the balsam is discontinued.

Cubebs, the fruit of piper methysticum, like pepper-corns in size and shape, are blackish-green grains with a pedicle. It was recommended freshly powdered as an anti-blenorrhagic after Crawford (1818), an English army surgeon, had learned its use in India, where it is a popular remedy. It is less effective than copaiba, but fell into discredit chiefly because it was given in such enormous doses. Thus Puche ordered, from the beginning of blenorrhœa, ʒ iiss. of the powder on the first day, and then a daily increase of ʒ iiss. until the discharge ceased. Powdered cubebs is given in gr. xv. to xlv. doses two or three times daily in wafers, or the ethereal extract, cubebin, is given in one-tenth this dose. Combinations of cubebs, especially with copabia, are also popular. For example:

℞ Pulv. cubeb., ... ℥ j.
Alumi, ... ʒ ij.
Root sambuci q. s. f. electuarium,
S. 3 to 4 teaspoonfuls daily.

℞ Pulv. cubeb.,
Bals. copaiv., ... āā ℥ ss.
Gummi arab., ... ʒ ij.
Aq. cinnamon., ... ℥ iv.
Syr. cort. aurant., ... ℥ j.
S. 1 teaspoonful t. i. d.

Velpeau (1826), Fenoglio (1846), Caudmont (1861), were special advocates of the combination of copaiba and cubebs, to which they attributed greater efficacy than to each one singly. Sigmund also favored the following prescription:

℞ Pulv. cubeb.,
Bals. copaiv., ... āā gr. xlv.
Extr. gentian q. s. f. pill xxx.
S. 8 to 9 pills daily.

The incidental effects of cubebs are not by far as disagreeable as those of copaiva, although it sometimes produces gastritis or urticaria.

Sandal-wood oil, acquired by distillation from syrium myrtifolium, was recommended by Henderson (1865) and Panas (1865). Although it was repeatedly recommended in

France, for example by Nirgon and Pathault, it found favor very late in Germany. It was only through the recommendations of Posner (1886), Meyer (1886), Letzel (1886), Rosenberg (1887), and Linhardt (1887), that it has secured general recognition. This is so much more deserved because, while equal in efficacy to copaiba, it does not possess the disagreeable incidental effects of the latter. It rarely causes gastritis, but in a few cases it has produced symptoms of renal congestion, which demand a certain degree of caution. It is given in doses of gtt. iij.–x. in gelatine capsules t. i. d., or

℞ Ol. santali, ... ℥ ss.
Ol. menth. pip., ... gtt. viij.
S. 15 to 20 drops 3 or 4 times daily.

Peruvian balsam and balsam of tolu have also been recommended, but only employed for a short time, and are inferior to the others in their effect.

Vidal (1877) recommended gurjun balsam, which had been previously recommended by Henderson (1865) as wood oil. Vidal prescribes:

℞ Balsam. gurjun.,
Pulv. gummi arab., ... āā ʒ j.
Syr. simpl., ... ʒ iij.
Infus. anis. stellat., ... ʒ x.
S. For one day.

Matico, obtained from piper angustifolium, was recommended by Favrat (1861), partly alone, partly in combination with copaiba. Infusions of the leaves were also used for injections. Scarenzio, Sigmund and Jullien deny any curative properties to this drug.

Turpentine, a very effective remedy but difficult of digestion, and which was employed by Swediaur (1798), is usually given in combination with cubebs, rarely alone.

Tar preparations and derivatives have also been used, but only with temporary success. Riemslagh (1862) advised aqua picea internally, Zeissl (1874) inhalations of oleum æthereum pini, Brémond (1874) turpentine vapor baths, Barton (1886) creasote.

Kawa-kawa, the root of piper methysticum, was recommended by Dupouy (1876). He digests gr. lxxv. of the finely cut root in 1 quart of water, filters and administers the gray aromatic fluid. Blackerby (1881) prescribes:

℞ Ext. kawa-kawa fld., ... ℥ iij.
Spirit æth. nitros., ... ʒ ix.
Syr. simpl., ... ʒ xviij.
S. 3 tablespoonfuls daily.

Schutt (1883) prescribes:

℞ Ext. kawa-kawa fld., ... ℥ ss.
Ext. rhus. aromat., ... ʒ ij.
Bals. copaiv., ... ℥ ss.
Tinct. cubeb., ... ℥ ij.
S. 4 teaspoonfuls daily.

Sanné (1886) orders extract of kawa-kawa in pills of gr. iss., 4 to 8 pills daily.

Among other remedies we may mention vinum colchicum opiatum, tinctura colchici, digitalis, hydrastis canadensis, arbutus unedo, gelsemium sempervirens, baccæ myrtillorum, asclepias incarnata, tincture of aloes, hasheesh, amaranthus spinosa, Jamaica dogwood, tinctura sierræ salviæ.

Finally, sal ammoniac has been recommended internally in large doses, potassium bromide in doses of ʒ j.–iss. daily, potassium chlorate gr. xlv. daily, and sodium salicylate ʒ iss. daily.

Dreyfuss (1890), Sahli (1890), Girard (1890), Lane (1890) and Hicks (1890) recommend salol (ʒ ij. in twenty-four hours) either alone or in combination with antipyrin.

Local Remedies.

Instrumental.—Local applications or urethral injections have been employed in clap since the earliest times, but they were always used merely as an adjuvant to the internal and general treatment. The syringes used were similar to those now employed. Blegny (1683) portrayed one which cannot be distinguished from one of to-day. Hahnemann used small syphons, Weikard used syringes with a flat end and a small

central opening, which was applied flat against the opening of the urethra. Swediaur (1798) gives directions concerning the construction of a good syringe which differ in no respect from those furnished by Sigmund. Other apparatus was also invented whose object was to render it possible to confine the penetration of fluid to certain parts of the urethra, or to allow it to enter with certainty the deep parts of the canal. To this class belongs Langlebert's syringe, "à jet recurrent" (Fig. 8). To an ordinary syringe is fitted a canula of platinum or bone, 5 to 6 cm. long, which terminates at the free end in an olive-shaped enlargement. The lumen of the canula opens immediately behind the olive in four small openings, which run obliquely backwards from within and anteriorly. The fluid always makes its way alongside the canula to the outside and never penetrates deeper than the olive. Bron's (1858) quite

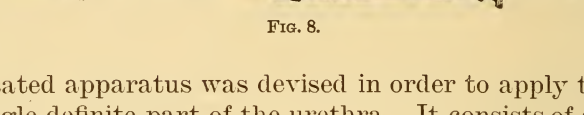


Fig. 8.

complicated apparatus was devised in order to apply the fluid to a single definite part of the urethra. It consists of a catheter with three openings, situated 2.5 cm. from one another. The first and last openings are concealed by rubber rings, which can be expanded through them. The middle opening is free and serves for the injection, while the rubber rings are distended, and occlude a portion of the urethra anteriorly and posteriorly. Diday (1858) was not the first one who knew that injections with the ordinary syringe did not penetrate farther than the bulb, but his plan was the first which secured irrigation of the entire urethra. While the bladder was moderately full he passed a narrow elastic catheter into the urethra until the urine began to flow and then withdrew it until the flow ceased. The eye of the catheter is then situated in the pars prostatica in front of the ostium vesicæ. A syringe is then fixed to the outer end of the catheter, and the injection made while the latter is slowly withdrawn. So long as the eye of the catheter is situated behind the compressor, the injection fluid passes through the pars posterior into the bladder; when it is situated in front of the compressor, it flows through

the pars anterior to the meatus and comes in contact with the entire urethra. Guyon's (1867) urethral syringe (Fig. 9) also permits applications to definite parts of the urethra. It consists

Fig. 9.

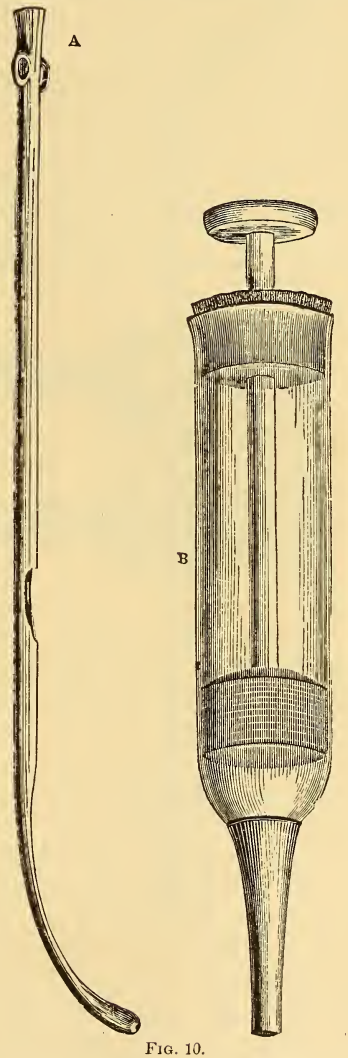


Fig. 10.

of a large Pravaz syringe whose piston is moved by turning a screw. A half turn corresponds to a drop. The anterior, conical, canula-like end of the syringe fits accurately, by

means of the thread of a screw, into a rubber olive-tipped bougie, which has a fine canal terminating at the tip in a small central opening. The bougie is introduced into the urethra and the fluid deposited by drops in the canal. Durham used a clysopump-like syringe. Prince devised a syringe with catheter-like tips, which could be screwed on, and which possessed an olive tip with lateral openings behind the latter. Milton is thoroughly convinced that injections with the ordinary syringes never reach the pars posterior. Thus we read on page 115 of his discussion on the development of strictures as the result of injections: "But I think I have evidence enough in my possession to prove that injections, as ordinarily employed, never reach the part where most of these strictures begin—that is to

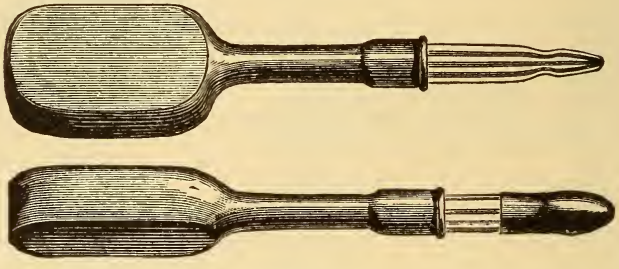


Fig. 11.

say, the bulb of the urethra and its immediate vicinity." He also emphasizes the fact that he has never been able to inject fluid into the bladder by a simple injection in the urethra, even with the aid of force.

With a correct view of these relations Milton devised his "long urethral syringe" (Fig. 10), a catheter, which is introduced into the urethra as far as the bulb, pars membranacea or prostatica, and to whose outer end a syringe, with a capacity of 200 cm., is attached. Burckhardt and Vajda devised complicated apparatus, which are hardly ever used, for the purpose of injecting fluid under high pressure, which could be regulated at will.

Balmanno Squire (1882) describes a simple and convenient syringe (Fig. 11). It consist of a flat, rounded, rubber syringe; two metallic plates, inserted in the two flat sides of the syringe and of the same size, make it possible to empty this handy balloon syringe completely. Ultzmann (1883) describes two in-

struments for irrigation and injection of the posteria urethra. The first, the irrigation catheter (Fig. 12), consists of a silver catheter, 16 cm. long, of medium curve, 14 to 16 Charrière, with the vesical end smooth and rounded. It contains either sieve-

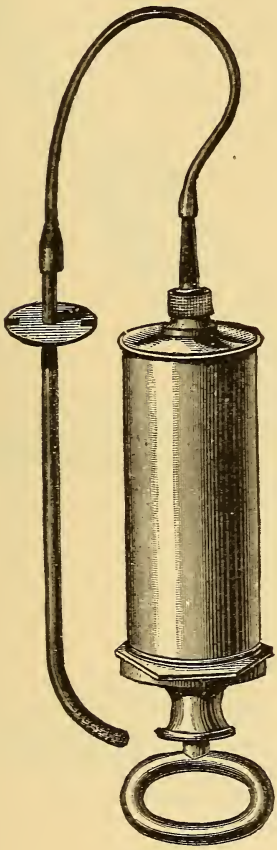


Fig. 12.

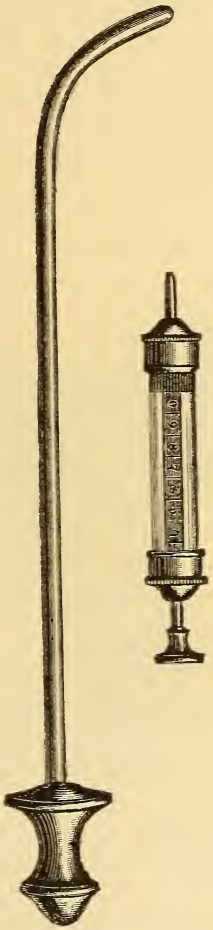


Fig. 13.

like openings or four lateral fissures, placed crosswise, 1 cm. long, 2 mm. wide. The extra-vesical part carries a disk of hard rubber, and a mark upon it shows the direction of the tip of the catheter. To the disk is fastened a soft-rubber tube, about 20 cm. long, which connects with an ordinary surgical syringe. The irrigation catheter is introduced into the urethra while

the patient is in the dorsal position, until the penis makes an angle of 120° with the horizontal, the surface of the abdomen. The tip is then in the posterior portion of the pars mem-

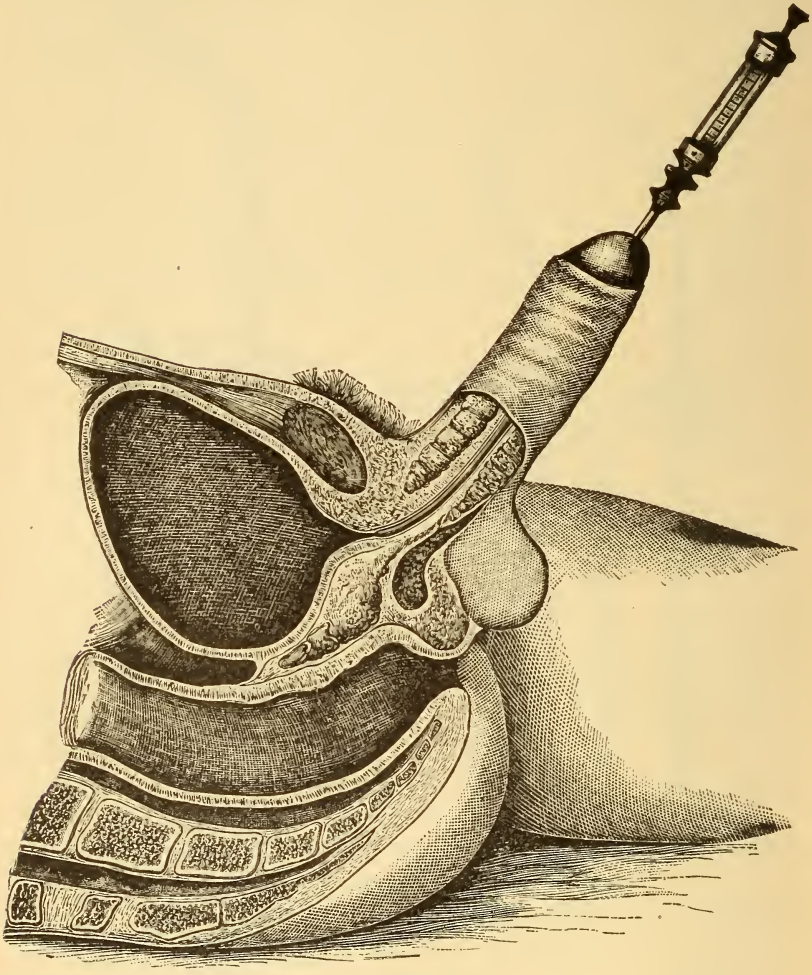


Fig. 14.

branacea. The fluid driven by the syringe into the catheter must now pass the pars prostatica and enter the bladder, but cannot regurgitate alongside the catheter. Upon removing the syringe the fluid should not escape from the catheter, as this would show that the tip is situated in the bladder.

The urethral injector (Fig. 13) also consists of a silver catheter of medium curve, 16 cm. long, with a calibre of 14 to 16 Charrière. At the extra-vesical end is an addition of hard rubber into which fits a Pravaz syringe. On introducing the instrument into the urethra the tip of the catheter enters the pars prostatica, when it makes an angle of 135° to the horizontal (Fig. 14). Aubert, Bourgeois, and Eraud recommend that injections in the pars anterior should always be made by passing a narrow elastic catheter as far as the bulb and injecting through this. In order to regulate the pressure of the injected fluid, Petersen and I recommended an apparatus coincidently. Instead of a syringe Petersen recommends a rubber tube with an olive tip at one end, a curved glass tube at the other end. This glass tube is dipped into a vessel and the fluid enters the tube by syphon action. The pressure is regulated by raising and lowering the vessel.

My apparatus (Fig. 15) consists of a syringe, with a capacity of 300 to 500 cm., which is hung parallel to the wall and vertical, at about half a man's height. The lower end carries a firm rubber tube about 1 m. long, to which is attached the pear-shaped tip, which can be closed by a stop-cock. The upper end, instead of being fastened by a screw, simply has a cover which is perforated by the piston-rod, and which can be put on like the cover of a box. The piston-rod terminates above in a flat disk, instead of a ring. The syringe is filled in the usual way, by suction through the tube and tip, and the latter must therefore be made of firm material in order to prevent compression by the pressure of the atmosphere. On account of the large dimensions of the syringe one filling suffices for many injections. The apparatus has a double use. It serves as a simple irrigator if the piston and cover are removed after filling. If the pressure is to be increased the piston and cover are allowed to remain and weights are placed upon the disk attached to the piston rod. I begin usually with ½ kilo and increase successively to 3 to 5 kilo. When the piston has a diameter of 4 cm. and the weights amount to 3 to 5 kilo the pressure of the column of fluid on each square centimeter of the urethral mucous membrane is 240 to 400 gm., and always remains the same so long as the simple apparatus works well. Hitches are not apt to occur, except from dryness of the piston, which is soon relieved by oiling.

Other irrigation apparatus for the anterior and posterior urethra have been devised by Lohnstein, Schuetze, Lanz and Burckhardt.

Lohnstein-Zuelzer's apparatus consists of a hat-shaped

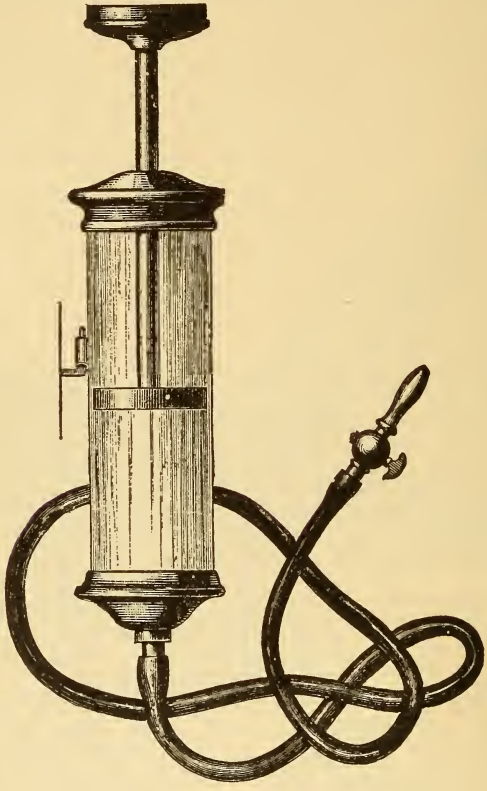


Fig. 15.

bell which covers the glans, and which contains two concentric tubes. The inner one is connected with the irrigator, the outer contains slit-shaped openings for the escape of the fluid. The chief object of the apparatus is to cleanse the urethra by irrigation with a six-per-cent. solution of sodium chloride preparatory to further treatment. Schuetze's instrument is constructed on the principle of the Fritsch-Bozemann uterine catheter.

Lanz's apparatus (Fig. 16) consists of two concentric tubes. The inner one ends just in front of the tip of the outer tube.

This is a thin metallic catheter whose walls are converted into threads by broad and long slits which extend almost to the visceral extremity and are provided at the tip with a cap.

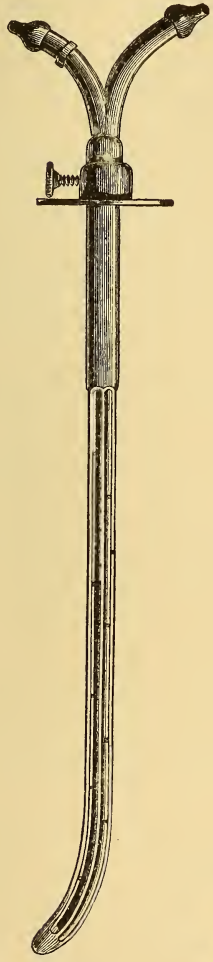


Fig. 16.

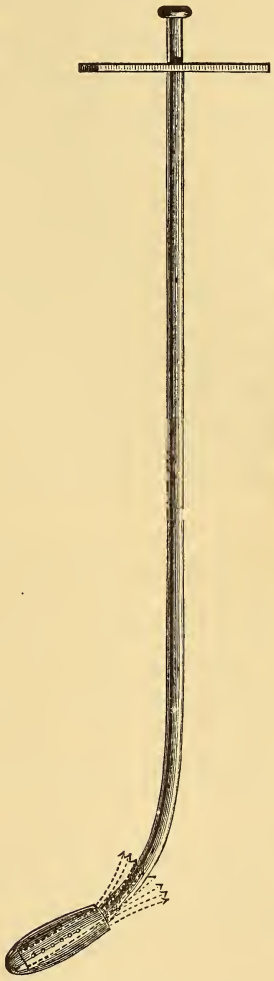


Fig. 17.

Fig. 18

The inner tube is connected with the irrigator, the entering fluid flows back from the inner wall of the cap of the outer tube, and, flowing backward, washes the mucous membrane which projects inward through the slits.

Burckhardt's injection apparatus (Fig. 17) consists of a narrow catheter with an olive-shaped tip. The part covered by the olive has a number of perforations. The fluid, injected through the catheter, escapes through the openings, rebounds from the inner surface of the olive and flowing backwards washes the urethral mucous membrane.

We need say very little concerning the ordinary clap syringes (Fig. 18). They should have a capacity of at least 6 c.cm., and at the most of 10 c.cm. The piston must fit snugly, and hence syringes made of hard rubber or tin are preferable to those of glass (in which the lumen is apt to be uneven) with a cork piston. The tip should terminate in a gradually diminishing cone, which will entirely close a large as well as a small meatus, and will only enter a few millimeters. Pear-shaped or duck-bill-shaped tips, which penetrate far into the urethra and close the meatus imperfectly, are to be avoided.

The syringe must also be well oiled so that it works smoothly, and the disadvantages of a jerky, intermittent movement of the piston avoided.

Medicaments.—The number of remedies used for injections is endless.

None has been employed so much, has been extolled and deprecated so much, as nitrate of silver, the most effective of all. Johnston and Barklet recommended it in America, and in Europe it was first introduced by Carmichael (1818) and Serre. It was soon employed not alone for the methodical treatment of clap, but also for the so-called abortive treatment. We will discuss this remedy later and will here simply state that the strength varies between 1.0:30.0 and 0.10 to 250.0 of water, according as it is used in abortive or methodical treatment.

Corrosive sublimate has long been used, and is now recommended anew, on account of its antiparasitic action. Musitanus, Malon, Gardane recommended it, and it was a favorite remedy of Hunter, who prescribed solutions of gr. ij. to ℥ viij. of water. Girtanner and Wallace also used it. It then fell into disuse but was restored to temporary favor by Mueller von Berneck (1846), but it is only since Fantini (1861), Bruck (1876), and particularly since our new parasitological knowledge that it has come into more general favor. When it was known that solutions of 1:3000 to 4000 were sure parasiticides, these

were adopted. But Barduzzi (1884), Keyes (1884) and Auspitz (1879) soon were heard in opposition, claiming that such solutions produced violent irritative symptoms. The more recent advocates of corrosive sublimate, such as Chameron (1884) and Vanderpool (1886) recommend solutions of 1:20000.

Sulphate, acetate and sulfo-carbolate of zinc, the former recommended by B. Bell, Lisfranc, Blancard and Large, the latter by Henry, have become lasting additions to our armamentarium, and are successfully used at the present time in solutions of gr. iij.–xv. to ℥ iij.

This is also true of permanganate of potash, which was first used by Rich (1864) in the enormous dose of gr. vj. to ℥ j., and then lapsed into oblivion. It was restored to favor by the recommendation of Bresgen (1867) and is now prescribed in solutions of gr. ¼–iss. : ℥ iij.

Acetate of lead, recommended by Bertrandi (1790) was favored by Ricord, particularly in combination with sulphate of zinc. This prescription, still known as Ricord's injection, has many advocates. The following is the original prescription:

℞ Zinci sulphat., ... gr. xv.
Plumbi acetic, ... gr. xxx.
Aq. rosæ, ... ℥ vj.
Tinct. catechu,
Tinct. opii., ... āā ʒ j.
S. To be well shaken and injected.

Sigmund often prescribed acetate of lead in the proportion of gr. xxx. : ℥ iij. of water.

Chloride of zinc has been recommended by Lloyd (1850), Debeney (1851) and Bumstead (1867). The latter dissolves ʒ iiss. of the chloride in ℥ ss. of water, and injects two to eight drops to a teaspoonful of water three times a day.

Among the alkalies caustic potash 1:200 was recommended by Fordyce (1758) and Warren (1771), and a solution of ammonia by Peyrilhe (1786).

Subnitrate of bismuth, first recommended by Caby (1854), is still often used in the proportion of 2.0:100. Recently there has been much opposition, particularly by Eraud (1886), to this remedy, which is insoluble in water, precipitates in the urethra, stops up Morgagni's lacunæ, and leads to the development of urethral calculi.

Chloroform, recommended by Venot (1850) was used for injections, especially by Parona, in the proportion of 1:100 to 200, but produces violent irritative symptoms. This is also true of chloral hydrate, which was used by Lecchini (1874) in a 1 per cent. solution, by Pasqua (1880) in a 2 per cent. solution.

Gazeau used sulphate of cadmium in solutions of 1:1000 to 2000.

Chloride of iron in solution of 1:100, bicarbonate of soda, 1 to 100, potassium bromide 5:150, and in 1 to 3 per cent. solutions have also been used.

Tannin alone or as tannin-glycerine was recommended by Lange, Deneffe and Hill, tincture of iodine by Masurel and Paquet. The latter injects tincture of iodine 5.0 in aqua laurocerasi 20.0. Zeller (1875) recommends:

℞	Tinct. catechu, ...	ʒ j.–iss.
	Glycerini, ...	ʒ j.
	Tinct. iodin., ...	gtt. xv.–xxx.
	Aq. rosarum, ...	ʒ vj.

The conviction that copaiba acts locally led Oates, Engelhart and Marchal to inject it in various mixtures. For the same reason Langlebert used eau destillée de copahu.

Among other remedies we may mention oil of eucalyptus, iodoform as injection in a mucilaginous mixture or in bougies. Campana prescribes:

℞	Iodoform., ...	ʒ v.
	Acid carbolic, ...	gr. iss.
	Glycerine, ...	ʒ iiss.
	Aq. destil., ...	ʒ v.
	S. For injection.	

Haberkorn and Delorme inject quinine. The latter prescribes:

℞	Quin. sulph., ...	gr. xv.
	Acid sulph. q. s. ad solut.,	
	Aq. destil., ...	ʒ iiss.
	Glycerine, ...	ʒ vj.

Resorcin is recommended by Muenich and Letzel in a 2 to 4 per cent. solution, Goll recommends thallin sulphate in 1 to

3 per cent. solutions. Blackerby injects fld. extr. yerba reuma 35.0, water 175.0. Schutt prescribes:

℞ Hydrastin muriat., ... gr. ix.
Iodoform pulv., ... gr. iij.
Glycerine, ... ʒ j.
Inf. sassafras, ... ʒ ij.
S. Four times a day.

Solid powders, partly inert, partly astringent, such as subnitrate of bismuth, oxide of zinc and iodoform have been recommended by Malles and Cattaneo to be blown into the urethra by means of special apparatus. The disadvantages of the severe irritation and the formation of concretions soon led to the abandonment of such methods.

Finally, we may mention that Ricord, Malgaigne, Desruelles and Tanchon not alone injected astringents into the urethra, but also introduced, by means of sounds, pledgets of lint soaked with the fluids and allowed them to remain several hours.

The "antrophores" recommended recently by Nachtigall, Lohnstein, Istamanoff and Bessard owe their development to the same principle. They consist of thin, flexible wire spirals with a smoothly polished button at one end, a ring, which prevents a complete entrance into the urethra, at the other end. The wire spiral, covered with shellac, receives a coating by dipping in medicated glycerin. This coating is solid at ordinary temperatures but melts in the urethra. The gelatin contains three to five per cent. thallin, or two to three per cent. sulphate of zinc, nitrate of silver, iodoform, etc. The antrophores were used indiscriminately in the different stages of acute and chronic blenorrhœa, so that it is not astonishing that their effect did not equal the expectations raised. When employed in time they exert an undoubted good effect. Lang's elastic drains, with a medicated covering, are similar in principle to the antrophores.

Methods.

We will now enter upon the explanation of the various methods which have been used for the cure of urethritis.

Before discussing the application of individual remedies, it

would be desirable to examine into their mode of action, but unfortunately this can only be done in an imperfect manner. The urethral suppuration, the main symptom of the gonorrhœal process, is merely a phenomenon of resistance on the part of the organism. The gonococci enter the urethra, where they find a suitable soil and proceed to increase. This colonization is not tolerated by the organism, which begins a combat with the virus; the numerous migrating lymph cells become laden with gonococci and endeavor to carry them off. This struggle continues until the last gonococcus has been destroyed or removed. The suppuration and inflammation are therefore necessary to the cure of the affection, so long as they remain within certain bounds. If we do not disturb these processes and no unfavorable external influences intensify the inflammation, it will run its course spontaneously within a certain period. We know that an anterior urethritis, which runs a typical course, lasts five to six weeks. There is one method of treatment, the expectant plan, which is confined to allowing the struggle between the gonococci and the tissues to terminate uninfluenced, and to merely keeping away all noxa which might produce useless or even injurious intensification of the otherwise beneficial inflammation.

A shortening of the course of the disease can only be effected by action upon the gonococci. It is senseless to attempt to shorten the course of the inflammation so long as the inflammation-producers, the gonococci, are still present.

The gonococci can be acted upon in two ways, either directly, by destroying them, or indirectly, by producing a change in their soil, the mucous membrane, which is unfavorable to their proliferation.

We have just mentioned a number of remedies which, when properly used, cause diminution and finally complete disappearance of the gonococci from the secretion, and more rapid recovery of the blenorrhœa, but the manner in which they act is not clear.

I believe that the balsams have a direct parasiticide effect upon the gonococci rather than an action on the soil, for the reason that urine saturated with the drugs remains acid and sterile for a long time in open vessels, and is therefore a bad soil, at least for those micro-organisms which cause decomposition of the urine.

In the application of astringent injections there is perhaps a double action, *viz.*, destruction of the gonococci and an unfavorable modification of the soil, but only to the extent to which the cocci and soil are exposed to the action of the astringent. This superficial action may explain the fact that the cocci which rapidly penetrate deeply are only destroyed gradually, in the degree to which the suppuration again brings them to the surface, and thus the process lasts a long time.

Treatment of Anterior Urethritis.

We have previously referred to the expectant plan of treatment, which looks only to the most careful acquiescence in hygienic and dietetic measures, but avoids all local therapeutic interference. This method started with the followers of the avirulistic school. It cannot be denied that such measures, which include rest in bed, often suffice for the cure of blenorrhœa, and I have very often observed, in hospital patients, recovery of an acute urethritis in a few weeks as the result of such treatment. But the period in which the blenorrhœa recovers in such cases is usually quite long, dependent upon the soil, the rapid development of the gonococci, and the viability of the pus corpuscles. If the soil is changed as the result of previous blenorrhagic disease, *i.e.*, after repeated infection, spontaneous recovery under expectant treatment is much more difficult of attainment. In the majority of patients, finally, it is impossible to carry out the hygienic-dietetic measures in the strictness necessary to effect a cure.

Next to this is the antiphlogistic method, which, starting from the theory of a simple inflammatory disease, recommended simple antiphlogistic regimen. Diuretics, leeches and venesections are employed, in addition to local applications of cold water. Although we do not favor the first-mentioned remedies, the local application of cold and warm water (the latter warmly extolled by Milton) is a very effective means, not of curing the blenorrhœa, but of keeping the inflammation within bounds, and preventing exacerbations as much as possible. This is also true of the application of an ice-bag (Shane) or of the cooling apparatus with flowing cold water recommended by Bumstead and Otis.

The topical application of cold water in the form of urethral

injections was also recommended by Picard, while O'Reilly, Curtis, Gordon, and Blackwell strongly advised irrigations and injections of water as warm as could be borne.

The medicinal, which is also chiefly a topical method of treatment has for its object to shorten the combat between the gonococci and mucous membrane, by attacking the cocci and also by making the mucous membrane more resisting.

It would be regarded as the ideal of medicinal treatment if we succeeded in preventing at once the further development of a beginning discharge from the urethra (whose blenorrhagic character is shown by the presence of gonococci) by destroying the gonococci, *i.e.*, the virus, and thus removing the cause of the disease. This plan, known as abortive treatment, was formerly practiced a good deal. Musitanus (1701) injected a mixture of calomel, two drachms, and aqua plantaginis, eight ounces; Fordyce and Warren injected strong solutions of caustic potash. Simmons (1786) recommended cauterization with the solid stick of the entire urethra, Ratier of the fossa navicularis. But Debeney (1843) was one of the most active advocates of this method, which was practiced by the French school, particularly by Ricord. Solutions of nitrate of silver of various strengths were always employed in these attempts at abortive treatment (0.7:30.0 by Carmichael, 0.5 to 1.0:30.0 by Ricord, 0.6 to 1.5:30.0 by Debeney). This plan was carried out in the following way. The patient, who was kept in bed, first urinated. The physician then injected a syringeful of the solution into the urethra, at the same time compressing the penis at the root in order to prevent the deeper penetration of the fluid into the canal. After the solution had acted upon the mucous membrane (which is always accompanied by increasing violent pains), it is allowed to escape from the urethra and a syringeful of a one per cent. solution of sodium chloride is injected. The patient, who is placed on somewhat low diet, now applies cold compresses, and takes measures to secure easy evacuations. The first discharges of urine are followed by violent pains. On the next day begins a profuse, bloody, purulent secretion, which gradually diminishes, and ceases almost entirely on the third day, when a fresh injection is made.

In a certain proportion of cases (Tarnowsky estimates it at about 40 to 50 per cent.), the urethritis is cured in about two weeks under this treatment. In others the inflammatory

symptoms become very violent after the injection, pain, chordee and vesical tenesmus set in as distressing symptoms, and the continuance of the abortive plan is made impossible. Berton and Venot often observed other disagreeable complications, such as peri-urethral abscesses, glandular inflammations, epididymitis, as the result of abortive treatment; and Simon, who practiced this method in Germany, observed severe complications, such as prostatitis and cystitis, in four per cent. of the cases. Langlebert used his syringe "à jet recurrent," in order to confine the injection to any part of the canal desired. Chloride of zinc gr. ¾: ʒ j., chloroform 1:30, aqua calcis 1:4, and alum 6 to 10:150 have also been recommended for abortive treatment. This was also attempted by the administration of large doses of copaiba and cubebs, but without striking benefit. The recent investigations on the rapid penetration of the gonococci into the deepest layers of the epithelium, and into the upper layers of the papillary body, offer no inducement for a return to the abortive plan of treatment. We could expect success from those remedies alone which would destroy the entire epithelial layer and would penetrate to the papillary bodies. Hence the damage would be much greater than the good to be derived from certain destruction of the gonococci.

In recent times Neisser (1889) recommends, as abortive treatment, the earliest possible injection of nitrate of silver (1:3000 to 1000) continued for a long time. He states that this ameliorates the course and intensity of the acute symptoms and results in a positive cure. I will hereafter furnish the reasons for my opposition to topical treatment in the first, acute stage, and will here merely state that I have repeatedly employed this method but have never been able to continue it. Violent pains on injection and in micturition, œdema of the glans and prepuce, and sanguinolent secretion always compelled me to cease the injections after a few trials.

Two other methods of abortive treatment have been recently recommended.

Janet (1892) advises that the entire urethra be irrigated at once with a solution of permanganate of potash (1:2000). Five hours later the anterior urethra is irrigated with a solution 1:1500, and five hours afterwards with a solution 1:1000. At the end of twelve hours another irrigation (1:2000) is per-

formed, and this is continued every twelve hours for four to six days. The results are said to be a rapid disappearance of the gonococci and cessation of the secretion. Apart from the difficulty of carrying out this plan of treatment, it is not absolutely reliable, from the few experiences which I have had, and does not prevent disagreeable accidents, such as increase of the inflammation, œdema of the glans, penis and prepuce, and irritation of the pars posterior.

The second method, recommended by Koester (1890), and especially by Jadassohn (1892), consists in the injection of ammonium sulfo-ichthyolicum (one to five per cent.). This is not really an abortive measure. Although, as a rule, it rapidly produces considerable diminution of the gonococci in the secretion and of the amount of the latter, the rapid destruction of all the germs is not effected. A few gonococci remain, and rapidly increase after cessation of the injection, so that the treatment must be continued with other remedies.

The failure of these "abortive methods" is a further proof of the rapid penetration of the gonococci into the depths of the tissues.

The only method of treatment that we practice at the present time is the methodical, local, symptomatic and curative plan. This plan, which is most generally adopted to-day, is unfortunately founded to too great an extent on an empirical basis, but we should combat the thoughtless and routine manner in which the method is carried out. The consideration of the individual symptoms and the adaptation of the treatment to the requirements of the individual case alone can be followed by success.

Symptomatic treatment, directed against individual symptoms, is always indicated when the symptom in question requires repression. But is causal treatment always indicated, so long as the process is present? We must answer this in the negative, and will mention a number of indications under which alone topical treatment is indicated.

1. Causal topical treatment with balsams and astringents is only indicated in uncomplicated blenorrhœa. A series of extensions of the blenorrhagic process, such as cavernitis, cowperitis, prostatitis, epididymitis, cystitis, are produced by the spread of the inflammation from the diseased mucous membrane to adjacent organs. As soon as one of these com-

plications develops, the topical treatment of the urethritis must be discontinued at once. In the first place a remission of the urethritis generally occurs on the development of the complication and makes its treatment temporarily superfluous. In the second place—and this is the most important reason and also holds good if the expected remission does not appear—every interference on our part during the existence of a complication usually aggravates the latter.

2. Early topical treatment, at a time when the disease is still increasing in intensity or is at the acme, is not indicated, and it should not be begun until the inflammation has passed the acme.

We have previously discussed the action of balsams and astringents on the urethral mucous membrane and have said that, under their influence, the number of gonococci and the amount of the secretion diminish. It might therefore be supposed that they should be given at the very onset of the disease, since it might be expected that the course of the disease would be made milder, that the inflammation would not rise so high. Whether this is so if injections are begun in the initial mucous stage, I do not know. Cases of this kind very rarely come under our observation, because the initial stage is so brief that it is generally overlooked by the patient. But if the purulent stage has set in, internal treatment should be employed with caution. If the inflammation is very acute, injections should not be ordered until the process has passed its acme. I know that I am at variance, in this matter, with some of my most prominent colleagues, who inject from the very beginning. But my conviction is founded not alone on an empirical but also on a scientific basis. I have never been able to convince myself that early injections shorten the process, but in some cases have observed direct injury from their use. After treatment of two groups of cases, in one of which I injected from the start, in the other after the cessation of the acute stage, I have become firmly convinced that in the former class the disease ran a milder course but lasted longer, and that leucocytes and gonococci (in scanty numbers) remained longer in the secretion than in the latter class. Zoege-Manteuffel (1892) reports that among 31 cases of blenorrhœa treated at once with injections complications developed in 25, and in only 4 cases among 24 which were not treated locally.

These early injections have been employed mainly since the bacteriological era. In the eagerness to attack the germs the importance of the antiparasitic action is exaggerated, and an important factor, the vis medicatrix naturæ, is overlooked. Inflammation and suppuration are effective weapons of defence, and should only be combated when we are able to replace them with something better. Now the action of all remedies employed at the present time for injection is partly antiparasitic, partly astringent. The parasitic action is very incomplete, because in the urethra the germicide comes in contact with albuminoids (cells, serum) and coagulates them, and the effect of the drug is therefore lost in part. Furthermore, the germicide and gonococci do not come in sufficient contact with one another. Some of the gonococci are located in places (glands, connective tissue) to which the germicide does not gain access.

Greater success attends the astringent action which we seek to obtain, but it is questionable whether we should so directly antagonize the vis medicatrix naturæ, with its weapons the pus cells and pus serum.

Another point must be considered. From Bumm's investigations on the development and spread of conjunctival blenorrhœa, we know that the gonococci penetrate rapidly to the papillary body, where they proliferate. They are gradually carried by the current of the pus serum to the surface, and it is only during the latter part of the purulent and during the entire muco-purulent stage that they proliferate upon the epithelial surface. Accordingly, the proper period for antiparasitic-astringent treatment would be the terminal stage.

If we carefully follow the course of untreated blenorrhœas we will usually be surprised by the rapid transition of the acute into the subacute stage. According to Bumm's description this is due to the final removal of the gonococci from the connective tissue of the sub-epithelium. One circumstance which favors this notion is the coincident appearance in the secretion of numerous epithelial clumps covered with patches of gonococci.

I therefore repeat that I do not consider topical interference, especially injections, indicated until the blenorrhagic inflammation has passed its acme, and the cocci, which are then proliferating on the surface of the epithelium, are open to direct attack.

3. The intensity of the topical interference must be inversely proportionate to the acuteness of the inflammation. The more severe the inflammation the milder the local measures, and *vice versâ*. We therefore use the mild treatment with balsams before the injections, then inject weak solutions of the milder astringents, and finally stronger solutions in increasing concentration and frequency. It should not be forgotten that suitable astringent action diminishes the intensity of the inflammation, a too strong action increases the intensity of the process, and thus gives rise to renewed invasion of the gonococci into the epithelium which has been fissured by the increased irritation.

The method of administration of the balsams will be considered in the discussion of the systematic treatment, but we will here make a few general remarks on injections. In acute anterior urethritis the injections are made by the patient with the clap syringe or my apparatus.

The utmost cleanliness should be observed. The apparatus used for injections should be carefully cleaned in order that no germs which have developed in it can enter the urethra with the fluid. The solutions employed should also be aseptic, and vegetable injections must therefore be eschewed. Palliard reports a case in which a young man, æt. nineteen years, injected an infusion of various herbs in recent urethritis. Three days after the first injection he was attacked by epididymitis and cystitis. The urine was cloudy and contained numerous bacteria, which the writer justly assumes to have been imported into the urethra with the injection.

The mode of injection must be carefully described and shown to the patient. The solution must come in contact with the entire diseased mucous membrane, and must therefore penetrate to the bulb. This is only possible if the patient places the tip of the instrument in the meatus in such way that no fluid can escape. The fluid should be injected gently and uniformly. Violent, forced, rapid injection is apt to produce reflex contractions of the ischio-cavernosi and bulbo-cavernosi muscles, which often eject the fluid from the urethra in the form of an ejaculation.

The amount of fluid should always be so large that it will render possible a slight distention of the mucous membrane, an effacing of the folds, and entrance of the fluid into the

openings of the follicles. The amount varies according to the inflammation, but we may say that it should always be so large that the distention of the mucous membrane caused thereby begins to grow annoying or painful. In the beginning, so long as the membrane is very much swollen on account of the acute inflammation and its elasticity is slight, a small amount of fluid will produce painful distention. When the process becomes older, the amount of fluid must be increased. These demands can be fulfilled very well with my apparatus. In the acute stage the patient uses it as an irrigator (without the piston) and allows the fluid to enter under slight pressure until the distention begins to grow painful, when he closes the stop-cock. When the process is older he allows larger amounts of fluid to enter under the gradually increasing pressure of weights placed on the disk of the piston, until the same effect is felt.

The injected fluid must remain for some time in the urethra in order to act sufficiently upon it.

It should always come in contact with the cleaned mucous membrane. The bladder should be evacuated and one or more injections of lukewarm water made before the fluid is introduced.

At first the injections should be made only once a day, viz., at night, then the number may be increased to two, three, finally four. Too many injections irritate excessively.

Having mentioned the general indications and recommendations we will now proceed to the consideration of the treatment of a typical case of acute anterior urethritis.

If a patient with recent acute urethritis—say about the second week after coitus (more recent ones, as we have said, are rare)—comes under treatment, our first care should be to recommend strict hygienic-dietetic rules. One question, which we must often answer at once, concerns the amount of fluids to be drunk. Some recommend very little fluid, in order that the urethra may be irritated as little as possible by urination, others recommend copious drinks, in order that the diluted urine should irritate the urethra only slightly. Both forget that a single discharge of concentrated urine may irritate as much as the frequent passage of diluted urine, and that both extremes should be avoided. In other respects we proceed symptomatically, combat sexual excitability with the well-known

remedies, acute inflammatory phenomena with the application of cold compresses, which are employed for one or two hours morning and evening. If the acute symptoms are very violent, local treatment is contra-indicated. There are a few remedies which seem to alleviate the pain in micturition, for example:

℞ Decoct. semin lini., ... ℥ xvj.
Syr. diacodii, ... ʒ iiss.
S. One tablespoonful every two hours.

℞ Herb. herniar.
Fol. uvæ ursi, ... āā ℥ j.
S. To be used as a tea.

Two or three cupfuls of the latter mixture may be taken warm daily. Fournier recommends:

℞ Sodii bicarb., ... ʒ j. gr xv.
Sacch. alb., ... ℥ j.
Succi citri, ... gtt. ij.
S. To be taken in one day.

This is dissolved in about 1 litre of water and taken cold.

If the inflammatory symptoms are slight, we may give local remedies even in this stage, prescribe a few capsules daily of oil of sandal wood or copaiba. These must be discontinued at once, however, if the irritative symptoms increase.

Towards the end of the second week or beginning of the third week the acute symptoms increase. The same regimen as before is continued, but more strictly. Rest, hygiene and diet must be very carefully watched. Antiphlogosis is useful only when carried out persistently. Employed for a time only, especially in the form of cold baths, it is injurious, inasmuch as the temporary relief is followed by a so much more violent reaction. The sexual irritability, the erections and insomnia, demand decided interference. We must not be afraid to secure the greatest possible amount of rest by suitable doses of the previously mentioned antaphrodisiacs, potassium bromide, camphor, lupulin, chloral hydrate, morphine injections, and at the same time order mild vegetable diet, and secure regular evacuations from the bowels. If the inflammatory symptoms are violent, as happens not infrequently at this time, we must

enter the field with our entire antiphlogistic armament. Thus, œdema, lymphangioitis, chordee, require rest in bed, low diet, persistent application of cold compresses or ice bags, inunctions of gray ointment, and narcotics. In addition to morphine injections suppositories are especially suitable:

℞ Ext. belladonnæ, ... gr. ij.
or morphin. muriat., ... gr. ij.
Butyr. cacao,
Ungent. cinerit., ... āā 3 ij.
F. supposit. No. x.
S. Two to three suppositories daily.

Next to chordee dysuria is particularly to be treated with narcotics. The catheter should never be used unless the indication is absolutely imperative.

Protracted warm baths, if preceded by narcotics, often secure easy and relatively painless micturition in dysuria. In other cases dipping the penis in cold water is attended with good results.

If the urethritis is not attended, even in this stage, with very severe inflammatory symptoms, and the administration of sandal-wood oil, etc., has been well tolerated, these drugs are to be continued.

But injections should never be made until the inflammation has passed its acme. I have recently made an exception with regard to ammonium sulfo-ichthyolicum, which I inject from the beginning in not too acute cases. On account of its slight astringent action it is less contra-indicated than vigorous astringents. It rarely produces severe symptoms of irritation. The number of gonococci and the abundance of the suppuration are rapidly diminished, but the course of the disease is not shortened. It merely passes more rapidly into the subacute stage, which lasts so much longer. The remission of the symptoms is a signal for the administration of the balsams in those acute cases in which no local treatment has been hitherto adopted.

We proceed to injections when the decreasing stage is well established. The pus, still abundant, loses its greenish tinge, becomes thin and milky. The pains on urination and erection are slight and rapidly diminish, the sexual irritability subsides. But it must not be forgotten that it is at this very time that

posterior urethritis may develop. Before ordering injections the physician must, therefore, satisfy himself concerning the condition of the pars posterior, and repeat this examination frequently during the further course of treatment. Not all injection fluids have the same value. We have already stated that the remedies and their strength must be increased. I can recommend the following practicable gradation: ammon. sulfo-ichthyolic. (gr. xv.–l.: ℥ iij.), potass. hypermang. (gr. ⅓–¾: ℥ iij.), zinc. sulpho-carbolic. (gr. vi.–xij.: ℥ iij.), argenti nitras (gr. ¾–iss: ℥ iij.). These remedies are indicated so long as gonococci, pus corpuscles and clap shreds are still demonstrable. If these have been absent for some time we may order: sulphate of copper (gr. ¾–1½: ℥ iij.), sulphate of copper with alum (gr. i.–vij.: ℥ iij.), and especially subnitrate of bismuth (℥ ss.–i.: ℥ iij.).

The injection should never cause more than a slight burning in the urethra. The urethra generally accommodates itself very rapidly to the remedy. An injection which burns to-day will be felt very little or not at all in a few days. In the latter event its action may also be regarded as illusory. Hence it is advisable to increase the strength of the fluid every few days within the limits mentioned, and also to change the injection fluid.

A very important question is, when is an acute urethritis to be regarded as cured,—when may the treatment be discontinued and the patient return to his ordinary habits of life?

Unfortunately mistakes are often made in practice by physicians and patients, both in the direction of too brief and insufficient treatment, and also of excessively protracted treatment.

Many patients are satisfied when the visible discharge of pus ceases. Unfortunately many physicians also discontinue the treatment when the patients inform them that the discharge has ceased.

It is clear *à priori* that considerable amounts of pus still flow from the pars anterior. But if the amount of pus is small, it remains upon the mucous membrane of the urethra, spread out in a thin layer, and is only washed away by the urine during micturition. This occurs so much more readily because the small amount of pus of the terminal stage is mixed with considerable viscid, tough mucus, which favors its adhesion to the mucous membrane. This muco-pus is produced mainly in

the bulb, inasmuch as the process, in typical acute anterior urethritis, passes from before backwards and halts in the third week at the bulb. Recovery also occurs in the same direction, so that in the fifth week the pendulous portion is healthy and the process is situated exclusively in the bulb. This is the time when no more secretion appears and many patients and physicians regard the process as cured. Thus urethritis of the bulb, while recovering, is most frequently disturbed in its normal course, and hence the most frequent localization of chronic urethritis in the pars anterior is found in the bulb.

The premature cessation of treatment can only be avoided by examination of the urine. Inasmuch as the acid urine coagulates the alkaline mucus, the small amount of pus will appear in the urine in the form of compact threads and flakes, the so-called clap threads; the urine is otherwise clear. So long as clap threads are found in the urine the process cannot be unreservedly regarded as cured.

Not infrequently, on the other hand, the disease is treated for too long a period. After every urethritis a certain irritative condition of the urethra remains, and is shown by increased secretion of clear, gelatinous mucus, as in urorrhœa. It is especially in the morning, when the patient has been troubled by erections during the morning sleep, that the mucus appears in increased quantity, glues together the lips of the meatus, or appears as a clear drop on pressure. Many patients regard this condition as blenorrhœa.

If this mucous secretion is left to itself, and care paid merely to the keeping away of external irritants, it will disappear spontaneously. But in the belief that it is a part of the urethritis the injections are continued. These constitute an irritant, however, and increase the secretion and irritative condition of the mucous membrane which gives rise to it. It often happens that physician and patient become impatient, and resort to a more vigorous injection. This stimulates the desquamation and proliferation of the epithelium, which, mixed with the mucus, gives the latter a gray or whitish color, which in turn seems to demand further injections. The patient thus enters a circulus vitiosus, the secretion becomes permanent, and if irritant bacterial immigration occurs as the result of uncleanliness, the beginning is made of one of those forms which have hitherto been called chronic urethritis.

The question of the duration of treatment can therefore not be answered by the secretion but only by examination of the clap shreds. There are two factors, in the main, which will prove decisive, *viz.*, the pus corpuscles and the gonococci. So long as the clap shreds contain gonococci, even if they are single, the treatment is to be continued. But even if the gonococci are missed in one or the other examination, the treatment is to be continued if the shreds are rich in pus cells. It happens not infrequently that pus cells but no gonococci are found in the shreds for two or three days. On the fifth or sixth day a few cocci again appear. And so the presence of large numbers of pus corpuscles is evidence of the existence of an inflammatory focus, whose cause may be attributed with great probability to the gonococci. But if the gonococci and pus corpuscles are both absent in the shreds, or the pus cells are present in very small numbers, while the majority of cellular elements are epithelial, the time for discontinuing treatment has arrived. The inflammation has then run its course and we have to deal merely with abundant desquamation of the young epithelium, which will only be increased by injections.

It is well to discontinue the injections gradually, not suddenly, one injection being made at first every second day, then every third day, etc.

After the injection cure is ended, the patient, adhering to the usual regimen, should be kept under observation for ten to fourteen days, and not until this period is past and the urine has remained clear, may we permit a gradual return to the ordinary mode of life. We must emphasize the advice that the return should be gradual, the patient indulging at first in the less dangerous privileges, and reserving coitus for the last.

This is the symptomatic treatment of an acute, typical anterior urethritis. In the most favorable event it requires a period of six weeks, a fact which it is well that the patient should be advised of beforehand.

Not infrequently, however, subacute urethritides, which have lasted several months, come under our treatment. The delay is due to improper management, lack of treatment, premature, improper, or interrupted treatment. In these cases we must inform ourselves concerning the presence of gonococci in the secretion and also concerning the cause of the delayed recovery. When it is the result of insufficient care and im-

proper regimen, these must be regulated; when treatment has been lacking, rapid cure is usually effected. The most unfavorable cases are those which have been protracted by untimely and unsuitable treatment. In such cases I have made it a rule, and always with good results, to treat expectantly at first, merely regulating the regimen. If all local treatment is abandoned the blenorrhœa at first usually increases in severity, and usually passes a certain acme. This generally takes place within ten to fourteen days, during which period the patient is only treated symptomatically; if the intensity of the process is not considerable, balsams may also be used but injections may not be employed. It is not until the process has passed its acme that I begin with systematic injections, which secure rapid recovery, provided that no injurious influences are at work.

Blenorrhœas of cachectic, poorly nourished individuals, who are sick from other causes, deserve special attention. If they run a very acute course, they are treated in the ordinary way, except that tonic treatment is added, nourishing diet, iron, but particularly iron and arsenic in the shape of Roncegno water and Levico water.

In these cases, however, the blenorrhœa often runs a torpid, mild course from the start, the inflammatory reaction is slight, the secretion thin and milky. Such a course indicates, from the beginning, tonic regimen, the well-known hygienic-dietetic measures, and cautiously conducted systematic injections. The patient should always be prepared for a protracted illness and careful attention must be paid to posterior urethritis, which is apt to develop in a latent manner in these cases and to give rise to complications. In the event of such a complication the injections must be discontinued at once.

Treatment of Acute Posterior Urethritis.

Acute posterior urethritis is a complication of anterior urethritis which develops either at the acme of the inflammatory process (in the third week), or subsequently from an exacerbation of the acute urethritis.

On the development of and during the acute stage of this, as of all other complications, the main rule is the cessation of all treatment, particularly local, of the anterior urethritis.

If the posterior urethritis has developed at the acme of the inflammation, no local treatment would have been adopted in any event. But if it develops later, from an exacerbation of the process, injections have already been ordered, perhaps, for the anterior urethritis. The local treatment must then be abandoned at once upon the development of the posterior urethritis.

It is then our first task to treat the posterior urethritis, and to treat the anterior urethritis only after the former is cured.

The posterior urethritis, on the other hand, may again give rise to a spread of the process, to the development of complications. In this event the complication, for example, cystitis or prostatitis, must first be treated, then the posterior urethritis and finally the anterior urethritis.

The hygienic-dietetic measures are the same as in anterior urethritis.

But I would caution the reader against the use of alkaline mineral waters. These waters diminish the acidity of the urine, a result which appears to me to be undesirable for two reasons. In the first place the acidity of the urine has already been diminished by the diet and rest, and in the second place alkaline pus (blood in cases of hæmaturia) will regurgitate into the bladder from the pars posterior. If the amount of these alkaline fluids, which enter the bladder, is abundant and the acidity of the urine has been considerably diminished by our medicinal treatment, this may constitute a cause for alcalescence and ammoniacal decomposition of the urine. The latter may be the immediate cause for the abundant proliferation of germs which have entered the bladder and thus for the production of cystitis. When posterior urethritis is present a sufficient degree of acidity of the urine is the best prophylactic against the spread of the inflammation to the bladder, against the production of cystitis.

The general indications are also the same in both. The most acute stage is treated symptomatically, the diminishing but still acute inflammation is first treated with mild then with more vigorous local remedies, at first with balsams, then with injections.

The symptomatic treatment of the acute stage is like that of anterior urethritis. Two factors demand special attention, *viz.*, the hæmaturia and the disturbances of micturition.

Hæmaturia is always an evidence of intense inflammation, and is associated with violent tenesmus; indeed it is usually caused by the latter. In some cases treatment of the tenesmus suffices to relieve the hæmaturia. The former demands our entire antiphlogistic armamentarium. In addition to rest, low diet and free evacuations, protracted lukewarm baths often render good service. But the greatest benefits are obtained from narcotics. Injections of morphine and suppositories of belladonna always relieve the tenesmus, and also the inflammation, inasmuch as the latter is intensified by the former. The previously mentioned decoctions, either with or without narcotics, such as infus. semin. lini, herniaria, folia uvæ ursi, also cause some amelioration and are indicated in the acute stage.

If the hemorrhage in the last drops of urine does not cease with the tenesmus, the former must be treated alone with hæmostatics, especially iron and ergotin. We prescribe:

℞ Ferri sesquichlor. sol., ... ʒ ss.
Aq. destil., ... ℥ vj.
Syr. cinnamon, ... ʒ v.
S. One tablespoonful every two hours.

℞ Ext. secal. cornut., ... gr. xv.
Sacch. alb., ... gr. xxx.
Mf. pulv. div. in dos. v.
S. One powder every three hours.

℞ Ergotini, ... gr. xv.
Opii, ... gr. iss.
Sacch. alb., ... gr. xxx.
Mf. pulv. div. in dos. v.
S. One powder every three hours.

Granules of Bonjean's ergotin or subcutaneous injections of ergotin are also given with advantage.

Dysuria, which is not infrequent in acute posterior urethritis, is also a spasmodic symptom, and therefore to be treated, in the main, by morphine and belladonna. The introduction of the catheter is to be avoided or reserved for the most urgent cases. A narrow elastic catheter may then be used during chloroform narcosis or after the administration of morphine (subcutaneously or in suppositories).

When the irritative symptoms have disappeared, in the main, and albuminuria is not present, we may proceed (in addition to the continuance of mild narcotic treatment by administration of two belladonna suppositories or infus. semin. lini with syrup. diacodii) to cautious local treatment. We may give a few (4 to 6) capsules of sandal-wood oil or copaiba, but these must be discontinued at once if more marked irritative symptoms, particularly increased tenesmus, become noticeable.

If the patient does not tolerate the balsams, we may give, instead of or in addition to them, salicylate of soda in doses of gr. xxx. three times a day.

When all irritative symptoms have disappeared for several days, especially if there is no severe tenesmus or albuminuria, and if the cloudiness of both portions of urine is decidedly lessened, we may proceed to local treatment with astringents.

We have previously stated that astringents, injected with the ordinary clap syringe, do not enter the pars posterior, and hence this method of injecting is to be avoided in the treatment of posterior urethritis.

The French recommend, in order to carry the fluid by means of the clap syringe into the pars posterior, to close the meatus and to push backwards the fluid in the urethra by means of pressure. This manipulation succeeds in some cases. The patient then finds that the pendulous portion, which was at first tense, becomes more flabby, and when the meatus is released, very little fluid escapes from it. In other cases, however, the fluid as soon as it reaches the compressor is ejected from the urethra by reflex, jerky contractions of the bulbo-cavernosi and ischio-cavernosi muscles.

This method is uncertain, and is always irritating even in the event of success. We deprecate it accordingly, and with Ultzmann, Aubert, Eraud, maintain that posterior urethritis should always be treated by the physician by direct local application of the remedy to the pars posterior.

It must not be forgotten that when the acute posterior urethritis is at a period suitable for injections, an anterior urethritis is also present, older and less severe than the former, and also suited to treatment with injections.

It will be our object, in all these cases, to secure contact of the astringent solution with the entire urethra, from the external to the vesical orifice.

The patient should never make the injections in posterior urethritis with the clap syringe. The anterior urethritis may be healed in this way, but the posterior urethritis, if not aggravated, is at least left to run its spontaneous course, which usually terminates in chronicity of the process. The best method of injection is that of Diday, or the use of Ultzmann's irrigation catheter, with distribution of the fluid over the entire urethra. In order to make the entrance of the solution into the bladder entirely innocuous it is advisable to make the injections when the bladder is moderately full. The removal of the fluid from the bladder is unnecessary. The solutions are to be lukewarm, and ʒ vij.–x. in amount, of which somewhat less than half is intended for the pars posterior, the remainder for the pars anterior. The urethra must be clean before introduction of the instrument, and the patient should therefore evacuate some, but not all, the urine in the bladder immediately before injection. In sensitive individuals a morphine suppository may be introduced before the first injections in order to avoid disturbing reflex contractions of the compressor. The injections should be made, at first every third, later every second day.

The following fluids may be prescribed:

℞ Ammon. sulfo-ichthyolic, . . . ʒ iiss.
Aq. destil., ... ℥ xvi.

℞ Acid carbolic., ... gr. xv.
Aq. destil., ... ℥ xv.

℞ Potass. hypermang., ... gr. iij.–viiss.
Aq. destil., ... ℥ xv.

℞ Argent. nitrat., ... gr. iij.–xv.
Aq. destil., ... ℥ xv.

Some employ injections in posterior urethritis by injecting the remedy through a catheter into the empty bladder and then allowing the patient to urinate. We do not consider this plan advisable. In the first place, it is well to avoid irritation of the walls of the bladder by the astringent, and in the second place, even "an empty bladder" contains sufficient urine to decompose the astringent in part or entirely. We also object to irrigation of the posterior urethra without a catheter by simple high pressure. Irrigations with a catheter

are undoubtedly the mildest method of injection and the most certain to prevent disagreeable accidents.

If the subjective symptoms have disappeared and the objective signs consist merely of slight mucous cloudiness of both portions of urine, we may advantageously employ the solutions recommended for acute anterior urethritis, particularly argenti nitrat. 0.1 to 0.2:100.0. In these cases "anthrophores" may also be used to advantage.

Acute posterior urethritis usually heals more rapidly than the anterior, so that we generally find, after the treatment has been continued for some time, that the second morning urine is entirely clear while the first is still slightly cloudy, *i.e.*, the posterior urethritis is cured, the anterior urethritis still present. Irrigations are then unnecessary; the anterior urethritis is to be treated with the clap syringe, and the treatment then discontinued in the manner described above

CHAPTER III.

CHRONIC URETHRITIS.

Etiology.

Chronic clap was recognized at a later period than the acute form, and although urethral stricture and its treatment by dilatation were known since the middle of the sixteenth century, the course and characteristics of the preceding chronic urethritis were not closely studied until the beginning of the present century. Girtanner (1788) characterizes chronic clap as: stillicidium muci puriformis vel limpidi ex urethra vix inflammata, sine stranguria, erectiones non dolorificæ, ab ulcere urethræ, aut a coarctatione præternaturali urethræ. Kuehn (1785) defines chronic clap as a discharge of moisture which is left over after a clap, and results from the weakness of the parts which have been affected. Eisenmann (1830) applies the term chronic to every case which lasts more than twenty-one days.

We have said that acute urethritis passes through a muco-purulent and mucous terminal stage before recovery ensues. This stage may become permanent, and it is to this protracted symptom-complex of the terminal stage of acute blenorrhœa that we apply the term chronic blenorrhœa.

This determines the etiology of chronic blenorrhœa in the widest sense. Every chronic urethritis develops as the sequel of an acute or subacute urethritis, whether anterior or posterior.

When the mucous or muco-purulent stage becomes permanent it usually becomes localized. The diffuse inflammatory process, which constitutes acute urethritis, persists in more or less circumscribed spots and recovers in the remainder of the mucous membrane. The causes of this localization reside in the anatomical conditions, the greater abundance of follicles and glands, and the consequent increased vascularization.

The anatomical investigations in Prof. Weichselbaum's Institute give the following results.

The foci of chronic urethritis were found in:

Pars pendula alone,	in	15 cases
Pars pendula and bulb,	"	1 case
Bulb alone,	"	1 "
Pars pendula and pars prostatica,	"	1 "
Pars pendula, bulb, and pars prostatica,	"	5 cases
Pars membranacea and pars prostatica,	"	1 case
Pars pendula, bulb, pars membranacea, and pars prostatica,	"	1 "
Pars prostatica alone,	"	6 cases
		31 cases

We will therefore define chronic blenorrhœa as the permanency of the mucous terminal stage of acute urethritis in a circumscribed portion of the urethra, with recovery in other parts. Its favorite sites are the bulbous, membranous and prostatic portions.

Its causes are in part neglect of the acute blenorrhœa in the sense of insufficient treatment, in part and more frequently, recurring relapses as the result of external injurious influences, and finally, rapidly recurring fresh infections.

We have already discussed the drawbacks of insufficient treatment. The diagnosis of recovery is often made prematurely because suppuration has ceased, while complete recovery has not occurred; but the process, which is confined to the bulb, produces too little pus to appear in the form of a discharge. And so the disease in the bulb remains untreated and becomes chronic.

In the same way the localization of acute urethritis is usually made very loosely or not at all, and the treatment only carried on with the syringe.

Now, if a mild posterior urethritis was present in addition to the anterior urethritis, the former is apt to be overlooked and alone remains chronic. To the insufficient or improperly localized treatment, are usually added other active injurious factors. The patient, either on his own responsibility or that of his physician, regards himself as cured and lives accordingly. This is usually attended with so much more serious

results to the not entirely healed process, because the patient believes that he should make up for the hardships of the period of treatment. Then comes a relapse, which is treated and disappears. Then follows another relapse on account of premature return to the usual mode of life. Thus relapse follows relapse, each succeeding one less pronounced and shorter, but with each one the process becomes more and more firmly seated, the local changes deeper and more serious.

The same condition is observed in fresh infections if these follow one another rapidly. Their acuteness successively diminishes, they grow more torpid and subacute, but each becomes more obstinate. The long duration alone predestines the transition to chronic blenorrhœa, because its mild course does not convince the patient of the necessity of thorough treatment, proper hygiene and diet.

One question must be here considered, viz., the question of the possibility of repeated gonorrhœal infections. Formerly this question was answered unhesitatingly in the affirmative, and reports of various new infections within a brief period were reported and believed. At the present time, however, we are more skeptical in regard to such reports. This skepticism is due to the obstinacy with which the gonococcus maintains its hold and to the fact that the recovery of the blenorrhœa is often assumed prematurely by the patient and the physician.

The following remarks may be made in this connection:

In the first place blenorrhœa, after its complete cure, furnishes absolutely no immunity. I have observed numerous perfectly reliable cases in which the patients were reinfected with a fresh blenorrhœa in one to three months after undoubted cure of an acute blenorrhœa.

Furthermore, the existence of a chronic blenorrhœa, whether it contains gonococci or not, is absolutely no hindrance to renewed infection. I have sufficient clinical evidence on this point, and at the same time Ghon and I have investigated it experimentally. In four patients suffering from chronic blenorrhœa, two with gonococci, two without the germs, we inoculated pure cultures of gonococci. At the end of forty-eight hours' incubation, in all four cases, a typical acute blenorrhœa developed with abundant gonococci, which were again demonstrated by cultures. The influence of this acute blenorrhœa upon the original chronic process was always beneficial.

Fresh infections are always distinguished from relapses by the fact that the relapses begin at once, the fresh infection only two or three days after coitus, *i.e.*, after a period of incubation.

There are also certain factors within the organism which favor the development of chronic blenorrhœa.

We have already said that torpid subacute blenorrhœas have a special tendency to pass into the chronic stage. On the other hand we know, from the symptomatology of acute urethritis, that this is more apt to run a torpid subacute course in cachectic, scrofulous and phthisical individuals.

Finally, the transition of many blenorrhœas into a chronic stage is attributed to a narrow meatus, to the stasis and regurgitation of the stream of urine which passes through the entire urethra in a broader column.

Nevertheless the real etiological factor of chronic, as of acute urethritis, is the gonococcus, which has a fixed settlement on circumscribed portions of the urethra. This will be considered more fully in the sections on symptomatology and anatomy. To one fact I wish to call attention here, *viz.*, that the gonococci usually suffer enfeeblement during their long protracted stay on the mucous membrane. It has, at least, been claimed by several writers (Noeggerath, Milton, Schwartz) that women are infected by their husbands, who suffer from chronic gonorrhœa, with urethritis which runs a chronic course, and very rarely with acute blenorrhœa.

Symptomatology.

The symptomatology of chronic urethritis is usually described as the escape of a yellowish or whitish drop from the urethra, and gluing together of the meatus, without subjective phenomena; these symptoms may be aggravated by external injurious influences.

This clinical history is inaccurate and corresponds to only a single form of chronic urethritis. All the different varieties cannot be brought under one head, and require special consideration.

The symptoms and course vary not alone according to the localization, but also according to the depth to which the circumscribed inflammatory process has extended. In some

cases it affects only the mucous membrane, in others also the submucous cellular tissue and other subjacent tissues.

From this stand-point we may distinguish several forms, which can all be arranged in two groups.

We have said that one of the characteristics of chronic blenorrhœa is its circumscribed localization. But if we include in the category of chronic blenorrhœa only those cases in which the process is really confined to a quite sharply defined spot, we would have to exclude a series of cases, because, although they present a torpid course and absence of acute inflammatory symptoms, congestive phenomena are also observed on larger or smaller portions of the mucous membrane. These are the transitional forms between acute and really circumscribed chronic urethritis.

The differentiation between these two forms, which I will call recent and inveterate chronic blenorrhœa, depends on the character and quantity of the secretion. If the urine, especially the morning urine, is examined in a large series of cases of chronic urethritis, the characteristic clap threads will usually be found. These shreds are the product of the circumscribed process which constitutes the chronic urethritis. In the one series of cases the shreds are found floating in cloudy urine, in the other in clear urine.

The cloudiness in the more recent cases of chronic urethritis is caused by mucus, and is owing to the fact that, in addition to the circumscribed patches which produce the shreds, there are more or less extensive parts of the mucous membrane in a condition of catarrhal hypersecretion, while the clear urine in the second series of inveterate chronic urethritis indicates that the remaining mucous membrane is normal. If an inveterate chronic urethritis is irritated by external influences, the symptomatology of the more recent form is not infrequently produced, but disappears after a longer or shorter interval. In like manner, the clinical history of the more recent form passes, in time, into that of the inveterate form.

Several forms of chronic urethritis may be differentiated according to the localization.

I.—Chronic Anterior Urethritis.

This furnishes the picture of the usually described typical goutte militaire. When the patient examines the penis in the morning, he finds a drop emerging from the meatus, yellowish or milky in the more recent cases, grayish white in older ones; in the latter event it not infrequently contains whitish little clumps. The morning urine, which is passed without pain, or, at the most, with slight burning and tickling at the orifice, is clear or cloudy and contains shreds. If the patient urinates in two vessels, that passed first alone is flocculent, and clear or cloudy, the second is always entirely clear. During the day the meatus is usually glued together by a small amount of mucus; the first usually clear urine contains flakes, but in smaller amount than in the morning. If the process is more recent and the mucous membrane hyperæmic, the mucus is stained more or less yellow by the larger or smaller amount of pus produced by the mucous membrane which is in a condition of chronic infiltration. This mucus escapes in the morning as a drop at the meatus, while that produced during the day, being smaller in quantity because washed away at shorter intervals by the urine, merely agglutinates the meatus. In the older cases the pus from the diseased portions of the mucous membrane is washed away by the first urine, and hence cloudiness of the second urine is impossible in both cases. Exacerbations of this chronic condition as the result of external irritants are so much more easily recognized.

Chronic urethritis, which is localized in the pendulous portion, has such distinct symptoms because the slight amount of secretion always gravitates toward the meatus. If the pus is formed in the bulb in small quantities it will remain there, and only appears in the first urine as clap threads, but does not flow out of the meatus nor is it visible as a drop. If the chronic urethritis is more recent, and the congestion and production of mucus upon large portions of the mucous membrane of the pars pendula are more extensive, the mucus may reach the meatus and agglutinate it. But if the urethritis is old, this mucus at the orifice is absent, the process is only noticeable by the clap shreds. The patient, in the absence of all symptoms, naturally regards himself as well. Slight exacer-

bations, such as burning during micturition, are explained by the new beer which the patient drank on the previous evening, and more severe relapses are regarded and treated as mild, new infections.

So long as the process remains localized in the mucous membrane, these are the symptoms which may persist for years. That such a chronic urethritis, situated solely in the mucous membrane, may heal as the result of recovery of the spot of infiltration by the formation of connective tissue and superficial cicatrices, I have proven by post-mortem examination. When the process extends to the submucous tissue, to the corpus cavernosum, and the chronic infiltration heals by the formation of retracting connective tissue, a new and gradually developing symptom of more serious significance is added to the clinical history, *viz.*, narrowing or stricture. Apart from spasm urethral strictures also arise from organic causes, from swelling or infiltration of the mucous membrane, or the formation of cicatrices. The former, known as soft strictures, are succulent, yielding, rarely attain a notable degree, indeed the stenosis is usually insufficient to narrow the pars pendula and bulbosa to the dimensions of the orifice. They cannot be detected, as a general thing, with the ordinary sound, but only with sounds of large calibre or urethrometers. Otis calls them "wide strictures." On the other hand, the strictures formed by retracting tissue have a tendency to constantly increasing narrowing. They are situated mainly in the bulb and its vicinity. Of 320 strictures, whose locality was examined by Thompson, there were situated:

1. At the orifice of the urethra and within two and a half inches of the pars pendula, 54=17 per cent.

2. At the middle of the pars spongiosa, two and a half to five and a half inches from the orifice, 51=16 per cent.

3. In the subpubic curvature, *i.e.*, the bulb and beginning of the membranous portion, 216=67 per cent.

The strictures always develop very slowly. Thus, Thompson gives the period of development among 164 cases in

10 cases during the acute blenorrhœa.
71 " 1 year.
41 " 3 to 4 years.
22 " 7 to 8 "
20 " 20 to 25 " after the termination of the urethritis.

This affection, which belongs to the field of surgery, has been the subject of such excellent, in part monographic, treatises that we will not consider it here.

II.—Chronic Posterior Urethritis.

Like the preceding form this runs a latent course in many cases. The clap shreds, which are produced only in the inveterate cases, remain deposited in the pars prostatica, and are discharged during micturition with the first urine. Nevertheless prostatic urethritis presents some variations in symptomatology which not infrequently permit us to ascertain its situation. This is true of the more recent form, with production of mucous secretion in addition to the clap shreds. If this mucous secretion is produced abundantly, as happens not infrequently during the night, it is discharged into the bladder, especially when the latter is considerably distended, and then causes cloudiness of the second urine. The diagnosis of chronic posterior urethritis is therefore favored by cloudiness (usually of a slight grade, which makes the impression as if the glass vessel, into which the urine was passed, is "sweating") of both portions of the morning urine, in addition to flocculi in the first urine. Another circumstance must be taken into consideration. The mucous membrane of the pars prostatica is rich in glands, which are enclosed in the prostate, and empty on both sides of the caput gallinaginis. The inflammation generally extends to the excretory ducts of these glands, and they become occluded by a plug of mucus, pus and epithelium, which has the appearance of a comma. Unlike the clap shreds, which are deposited on the mucous membrane, these quite firmly adherent plugs are not washed away by the first stream of urine. They are expressed by the contraction of the compressor muscles, which shut off the bladder and squeeze out the last drops of urine from the pars posterior, and they are therefore found in the second urine. A second, slightly mucous, cloudy urine, or the presence of hook-shaped and comma-shaped clap shreds in the second cloudy or clear urine, testifies in favor of chronic prostatic urethritis. If it is confined to the mucous membrane, it usually presents no subjective symptoms.

The process is essentially different and much more serious

when the inflammation extends deeply, beyond the mucous membrane. In the pars prostatica the mucous membrane passes over the prostate, an extremely complex organ, which is very rich in nerves and glands, is intimately related to the sexual organs, in its developmental history is analogous, in a certain sense, to the female uterus, but belongs to the uropöetic system on account of its muscular tissue. Extension of the chronic inflammation, at first to the caput gallinaginis and the glands of the prostate, then to the prostate itself, produces a severe form of chronic urethritis. Irritative symptoms of various kinds set in, and affect the secretion of urine as well as the sexual sphere and nervous system.

Tenesmus occurs as a disturbance of urinary secretion. In some cases this is manifested merely by somewhat more frequent desire to urinate; the patients simply imagine that the capacity of the bladder has diminished.

In other cases the feeling of increased desire to urinate is provoked by other functions, especially defecation and coitus. After each defecation, especially if the passage of firm fecal masses has exercised strong pressure on the prostate, the patients experience a more or less violent desire to urinate, which cannot be satisfied, inasmuch as the bladder was emptied during defecation. This desire lasts until urine has again collected in the bladder and has been discharged, whereupon it ceases at once. In other cases the patients are compelled to urinate two or three times at short intervals before the tenesmus ceases. It may be produced by examination per rectum and pressure above or upon the prostate.

In some patients annoying, but not violent, tenesmus occurs after coitus or pollutions, but ceases after the patient has micturated one or more times at short intervals.

In addition, there are usually irritative symptoms in the sexual sphere. The patients often complain that the feeling of pleasure during coition is lost. Or they complain of a more or less violent darting pain in the back part of the urethra or the rectum, which occurs at the moment of ejaculation and drowns the feeling of pleasure. The form of impotence known as irritable weakness, is also very frequent. The patients have good erections and the sexual excitement is present, but this causes premature discharge of semen, which occurs before immissio or immediately after the beginning of coitus. The

erection then subsides at once and a long time elapses before a new one develops. Pollutions are also a frequent complaint of the patients, who experience a coincident diminution of potency.

These patients are very often frightened by another circumstance. They often tell us that they suffer from an escape of semen. On closer inquiry it is learned that with each defecation, especially if difficult, the patients notice the escape of a cloudy, thickish, mucous fluid which they regard as semen. Pressure on the prostate through the rectum discharges the same secretion, which is shown by microscopical examination to be the product of the prostate in a condition of catarrhal inflammation (prostatorrhœa)

Other patients really suffer from spermatorrhœa, but it usually remains latent. Not very infrequently a few spermatozoa can be found in the urine of patients suffering from chronic urethritis. They are found occasionally in prostatorrhœa, but their number is small. In other cases semen is discharged in abundance during micturition and defecation—micturition and defecation spermatorrhœa. Fuerbringer regards this as the result of evacuation of the seminal vesicles by pressure, the ejaculatory ducts being relaxed at the same time by the chronic blenorrhœa. In a case of profuse defecation-spermatorrhœa from chronic urethritis in a man of thirty years, I observed the discharge of exclusively motionless spermatozoa, in addition to impotence and complete absence of erections.

Fuerbringer (1886) showed that the spermatozoa in the seminal vesicles are motionless, and that it is only the entrance of the normal prostatic fluid which awakens their latent vitality and makes them capable of movement. This explains my observation of motionless spermatozoa in defecation-spermatorrhœa, inasmuch as the semen evacuated in this way is probably not mixed with prostatic secretion. Fuerbringer has reported similar observations. The prostatorrhœa just mentioned also merits attention from another point of view. The normal prostatic secretion is acid. Mixture with alkaline pus may make this reaction neutral or even alkaline. Will the prostatic secretion, when changed in this way, also vitalize the spermatozoa? In this way a simple posterior urethritis may give rise not alone to impotentia coeundi, but also to impotentia generandi.

With the implication of the caput gallinaginis, an organ extremely rich in nerves, is produced a series of morbid nervous phenomena, which are manifested by increased irritability and exhaustibility of the nerves, and is known as sexual neurasthenia.

The functional sexual disturbances which we have already mentioned also belong to the domain of neurasthenia. In addition there is an entire series of nervous disturbances which are partly localized, partly of a spinal nature, and in part are manifested by general nervousness and neurasthenia. The local nervous disturbances include hyperæsthesiæ, paræsthesiæ and paralgiæ in the urethra. During micturition the patient experiences a feeling of heat or burning in the urethra, which makes him think of an inflammatory process in the canal, or sometimes pains and darts in the urethra appear spontaneously. Many patients complain particularly of a dull painful feeling, as if the penis were constricted in the region of the urethra. The hyperæsthesia is not infrequently so great as to produce reflex spasms of the compressors. The urine is then ejaculated by jerks in a thin stream, and gives rise to the notion of a stricture. Introduction of a sound into the urethra produces spasmodic contractions, especially of the compressors. The painful sensations also radiate into the distribution of the plexus sexualis, along the spermatic cord and into the testicles (partly as dull pressure, partly as lancinating pains), and also into the perineum and the anal opening. The latter in particular is not infrequently the site of hyperæsthesia and reflex spasms. The latter are often so violent that digital examination per anum becomes impossible. In other cases the anus is the site of an intolerable pruritus which is either continuous or paroxysmal. The scratching induced by the pruritus gives rise to eczema. Frequent eruptions of herpes on the glans, prepuce and integument of the penis also annoy the patient. These develop spontaneously or follow sexual excitement, coitus or pollutions. The general condition always remains good, the appearance and nutrition may be excellent. Nevertheless the patients are usually in a deplorable state. The impotence and pollutions depress the mind, the various sensations rouse the belief in some serious disease which is concealed by the physician, the mood is gloomy and hypochondriacal. This is especially true when the nervous disturbances spread

farther, and other spinal symptoms are added. These include the various manifestations of spinal irritation, pressure and pain in the back, formication, cold or heat along the spine, radiating neuralgias and paralgias, particularly in the lumbo-sacral plexus. The neurasthenic symptoms may also spread farther. Digestion then suffers, symptoms of gastric and intestinal catarrh set in, but are only the result of atony. These reduce the patient, and his condition is thus aggravated materially. The nervous symptoms become more severe. There is general depression, pressure in the head, mental obtuseness, palpitation of the heart, etc. The unstable vasomotor system causes rapidly changing color, pallor and redness, especially in the face. Digestion is poor, the local symptoms in the domain of the uropoëtic and sexual organs attain considerable intensity—no wonder that not a few of these patients terminate their existence by suicide.

Secretion.

We have already described the various forms under which the inflammatory secretion appears in chronic urethritis. This secretion may appear in the form of a drop, or it is so slight or is produced so deep in the urethra, that it cannot escape, and is then found in the urine in the shape of shreds.

If it escapes from the urethra as a drop, its microscopical appearances are like those of the pus in the terminal stage of acute urethritis. We then find multi-nuclear pus cells, either singly or arranged in small groups, and various transition forms of epithelium, round, polygonal, spindle-shaped and caudate cells with a large nucleus. In addition large uni-nuclear flat epithelium and cylindrical epithelium cells are not infrequent.

These cellular elements, agglutinated by finely granular mucin, are found more frequently in the urine (Plate III., Fig. 8) as clap threads than in the form of drops. Macroscopically we may distinguish two varieties or extremes of these clap shreds. They may be narrow, mucous, delicate and transparent, often very long and branched shreds, which consist of a good deal of mucus and few cellular elements, or they are shorter, firmer, whitish threads, in which the cellular elements predominate. The proportion of epithelial and pus cells varies.

In the first-mentioned form the epithelium predominates, in the latter the pus cells. Mucous threads with much epithelium are a more favorable prognostic sign than short shreds with much pus.

The shape of the shreds varies, but does not permit any conclusion with regard to the situation or intensity of the process. Produced upon the diseased mucous membrane and adherent to it, they are separated by the stream of urine and carried away. In addition we find not infrequently short, comma-like, punctate, usually firm flocculi. These come from the excretory ducts of the various glands and follicles, and, when present in large numbers, are significant of a more intense implication of the urethral glands and therefore of a severe process. As we have previously remarked, these comma-like shreds, which are found in the second portion of the urine and are formed in the glands of the prostate, are signs of chronic prostatic urethritis. Their structure is usually characteristic. They are composed of two superimposed layers of cylindrical cells. The upper layer, consisting of large cells, sends processes into a mosaic of small, almost round epithelium cells (Fuerbringer, 1883).

The microscopical appearances of prostatorrhœa are essentially different. Aside from the negative condition of absence of spermatozoa or their presence in small numbers, we find in the prostatic secretion (Fig. 19) numerous pus cells, polygonal and cylindrical epithelium, more rarely the double layer of cylindrical epithelium of the excretory ducts, laminated amyloid bodies, lecithin granules, and finally Boettcher's characteristic "sperma crystals." These are needle-shaped and whetstone-shaped crystals, discovered by Schreiner (1878); they consist of a salt of phosphoric acid, are peculiar to the prostatic secretion, and give the characteristic odor to the latter and to the semen. In order to demonstrate them, the secretion of the prostatorrhœa must be examined pure, and in particular it must be kept free from admixture with urine. To a drop of the prostatic secretion is added a drop of a one per cent. solution of ammonia phosphate, and the mixture allowed to dry slowly under the cover glass; very beautiful crystals then form.

An important question is that of the presence of gonococci. These are found so constantly and exclusively in acute

gonorrhœa that their absence from an acute purulent secretion of the urethra excludes blenorrhœa unconditionally. The conditions in chronic gonorrhœa are not so favorable. Their number is small, they cannot always be found, and in addition other, in part similar, micro-organisms are also present.

Goll (1891) made systematic examinations of numerous cases of urethritis with regard to the presence of gonococci and arrived at the following results:

Duration.	Number of Cases.	Positive Findings.	Negative Findings.	Percentage.
4–5 weeks	85	40	45	47
6 "	54	21	33	38
7 "	35	11	24	31
2 months	75	15	60	20
3 "	76	13	63	17
4 "	62	13	49	21
5 "	43	8	35	14
6 "	55	8	47	14
7–9 "	108	21	87	19
1 year	83	12	71	14
1½ years	76	7	69	9
2 "	135	7	128	5
3 "	80	2	78	2.5
4 "	37	..	37	..
5 "	20	..	20	..
6 "	22	..	22	..

Hence, the finding of gonococci in chronic blenorrhœa is inconstant. The clap shreds or pus drops may often be examined for several days without disclosing the gonococci. Then they may reappear in larger or smaller numbers.

But one circumstance often characterizes the gonococci: they take part in the exacerbations of the process to which they have given rise, by increasing in numbers. It happens not uncommonly that the secretion is examined for several days, and various bacilli and cocci, also diplococci, but no sufficiently characteristic gonococci are found. Then follows an exacerbation. At once the gonococci appear in the more abundant pus, and in particular we detect the characteristic pus cells, which are filled with numerous pairs of cocci. At the same time, the other forms of bacilli and cocci have disappeared as if by magic. The question is therefore justified whether the micro-organisms which are found in chronic urethritis, and which are, in part, identical with those found by

Lustgarten and Mannaberg in the normal urethra, can vegetate in the blenorrhagic, inflamed and suppurating urethra. The question is an open one, but according to the views mentioned above, it may be answered in the negative, particularly as the pus is always found free from micro-organisms in chemical or traumatic suppurations from the urethra.

In order to convince ourselves of the presence of gonococci in the secretion of chronic urethritis it is only necessary to induce an exacerbation or relapse. The patient himself often

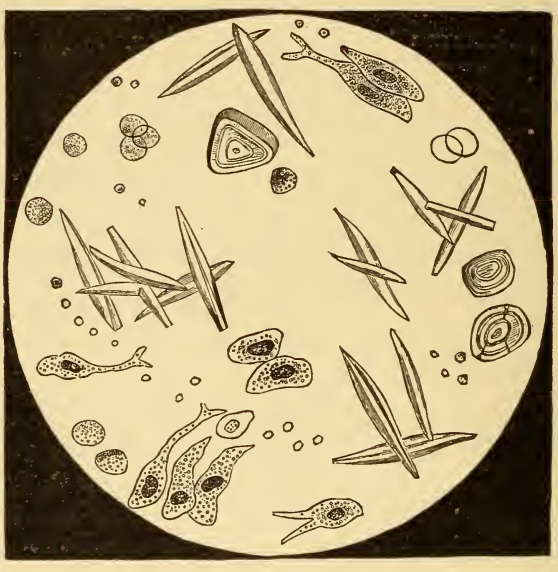


FIG. 19.

does this. In other cases the physician stimulates the secretion for the purposes of diagnosis. It is sufficient to inject, by means of Ultzmann's injection catheter, a few drops of a ½ to 1 per cent. solution of silver nitrate in order to secure suppuration, which generally contains gonococci in abundance. In order to avoid confusion with other micro-organisms Neisser irrigates the urethra several times with a solution of corrosive sublimate (1: 20000). An irritation develops and gives rise to suppuration and desquamation of the upper layer of cells. With the latter are removed the accidental micro-organisms

adherent to them, while the gonococci, which proliferate in the tissues, remain intact and appear in increased numbers in the pus of the next few days.

Nevertheless there are cases in which, despite repeated examinations for several weeks and despite one or more artificial exacerbations, no positive results with regard to the discovery of gonococci can be reached. In these cases we must arrive at the conclusion that the gonococci have perished, but that the changes produced by them continue to develop. The secretion then contains, as a rule, no pus cells, but numerous epithelial cells, and, in addition to other inconstant bacterial contaminations, in some cases narrow, short bacilli often arranged in short chains upon the cells (Plate IV., Fig. 11). We therefore have to deal no longer with suppuration but with epithelial desquamation.

This is either the result of a process which has run its course, the epithelial thickening, or of increased epithelial desquamation due to a micro-organism, but not of the blenorrhagic process.

We have already said that, in addition to gonococci, other bacteria are found in the chronic cases. These are not constant. There are always a large number of blenorrhœas in which we find no gonococci or other micro-organisms. Then there are others in which, even in the terminal stage of the acute urethritis, various micro-organisms are found in addition to the gonococci, and this is also true of chronic gonorrhœa.

The micro-organisms are mainly bacteria, more rarely cocci. The former include short and broad, narrow and long, or slightly curved comma-like forms which are found in short chains or groups usually free between or upon the cells. The cocci may be small and arranged in short chains or groups of chains, or somewhat larger diplococci about the same size as gonococci, or large spherical cocci in short chains; finally zoöglœa forms (Plate IV., Fig. 9). Petit and Wassermann (1891), but especially Janet (1892), have studied these micro-organisms. In regard to the gonococcus and these bacterial contaminations, Janet divides blenorrhœa into three phases: First phase, gonococcus alone; second phase, gonococcus and bacterial contaminations; third phase, bacterial contaminations alone. These different bacteria usually enter the urethra during

coitus and find a good nutrient in the catarrhal membrane. They are capable of continuing the process, and, after recovery of the gonorrhœa proper, may produce a catarrhal, often obstinate, pseudo-gonorrhœa.

I could never detect any gonococci or other micro-organisms in the secretion of prostatorrhœa, despite numerous investigations.

The question of the occurrence of gonococci in chronic clap is associated with another important question, *viz.*,

The Infectiousness of Chronic Gonorrhœa.

This question was answered differently at different times. Kuehn (1785) believed that when the secretion lost its purulent character, the danger of infection was gone. Hunter, B. Bell, Sallaba, Girtanner, Baumès and Ricord denied the infectiousness of an after-clap. On the other hand, Rossen, Simon and Geigel warned against trusting even the oldest clap. Gosselin denies the infectiousness, while Milton reports several cases of infection by the secretion of old chronic urethritides. Neisser (1884) was the first who studied the subject scientifically. He proved that the infectiousness of chronic blenorrhœa is a conditional one, in so far as the secretion may contain gonococci, that there are cases in which the secretion only contains the cocci at times, and finally others which are always found to be free from gonococci despite the most careful and frequent examinations. Furthermore, since the secretion is small in amount, and after being washed away by the urine requires a considerable time for its regeneration, it follows that a single act of coitus with an individual suffering from chronic blenorrhœa does not necessarily produce infection. As the result of numerous examinations I concur in this opinion and permit a patient who is suffering from chronic blenorrhœa, *i.e.*, the morning drop or clap threads, to have marital intercourse only after I have convinced myself by a two to four weeks' daily examination of the secretion or clap shreds that these contain only epithelium and no pus cells, and when, after irrigation of the urethra with a solution of silver nitrate or corrosive sublimate and consequent suppuration, the secretion is entirely free from gonococci, and there is no further indication for the continuance of treatment.

The conditions which I require are, accordingly, the absence of gonococci, pus corpuscles, and peri-urethral complications. These conditions have been since accepted by numerous authors, including Brewer (1891), Goldenberg (1892), Janet (1892), and Letzel (1893). One condition I must especially emphasize, viz., the absence of pus corpuscles. The presence of shreds or pus corpuscles in the secretion is always an indication that the inflammation is not extinguished. It is possible that the inflammation still continues despite the disappearance of the gonococcus, its original etiological factor, but this will probably not be true of many cases. On the other hand, the question of the presence of gonococci is often answered with difficulty. Positive findings put the matter beyond question, but negative findings do not prove that gonococci are not present. After long and laborious examinations with negative results the gonococci may suddenly reappear, so that I most urgently caution against answering the question with regard to marital intercourse from the results of bacteriological examination. This should be refused so long as pus corpuscles are present.

Inasmuch as gonococci are often present in the secretion of the pars posterior but absent in that of the pars anterior, the examination of both parts should be performed separately. The shreds coming from the two localities may be separated by the irrigation test. If the pars anterior is washed from behind forward by means of the catheter introduced to the bulb and the patient is then allowed to urinate, the secretion of the pars anterior will be found in the water used for irrigation, that of the pars posterior in the urine.

Localization.

We have just described the various forms of chronic urethritis and their symptoms.

This description shows a differentiation of chronic blenorrhœa into recent and inveterate cases; in the former the clap shreds appear in cloudy, in the latter in clear urine.

Chronic blenorrhœa also varies, not alone according to the extent of surface involved, but also according to the depth to which the process extends. In some cases it runs its course superficially upon the mucous membrane, in another group it ex-

tends to the underlying tissues, to the corpus cavernosum and the prostate. Hence the question always arises, Is the process situated in the pars anterior or posterior, or in both—is it purely mucous or is it complicated by submucous changes (periurethritis and circumscribed cavernitis for the pars anterior, colliculitis seminalis and prostatitis glandularis for the pars posterior)?

An approximate localization is possible from the consideration of the symptoms and examination of the urine. Thus, a discharge from and agglutination of the meatus, indicates anterior chronic urethritis of the pendulous and bulbous portions. Mucous cloudiness of the second portion of the morning urine, comma-like flocculi in the second portion, prostatorrhœa and neurasthenic symptoms favor the diagnosis of prostatic urethritis. But these symptoms are not conclusive, and their absence does not exclude the localization in question. Thus, there may be a mild posterior urethritis in which the mucus does not enter the bladder on account of its small quantity and in which the glands are not implicated, so that no comma-like shreds are found in the second urine. The process is superficial, therefore no affection of the caput gallinaginis, no neurasthenic disturbances. Hence, if we confine ourselves to an examination of the patient, we will overlook the process in the pars posterior. This remains untreated, therefore becomes aggravated and finally leads to severe symptoms, which could have been obviated by early treatment. Hence the attempt was made at an early period to determine the site of chronic urethritis more accurately. Leroy d'Étiolles introduced into the urethra as far as the bulb a bougie which carried a small hidden sponge at the end. The sponge was then exposed and the bougie withdrawn, so that the pars anterior was cleansed. An ordinary bulbous bougie was then introduced into the pars posterior. If mucus or pus adhered to the tip, this could only come from the pars posterior. The following is Zeissl's method: The patient, who has not urinated for several hours, receives an injection of pure water into the pars anterior in order to wash away any flocculi contained therein. After the water, which at first contains shreds, escapes clear, the patient is allowed to urinate. If the urine then contains shreds, they must be derived from the pars posterior. A better plan than that of injection with the clap syringe, as performed by Zeissl,

is that of inserting an elastic catheter as far as the bulb, performing recurrent irrigation of the pars anterior, and then allowing the patient to urinate.

Kromayer (1892) has recently recommended a very practical method. After the patient has retained his urine for several hours, a solution of methyl blue is injected with the clap syringe. This passes to the bulb and is allowed to remain one or two minutes. The patient then urinates. The shreds from the pars anterior are stained with the methyl blue, those from the pars posterior have a white color.

The French, especially Guyon, Jamin, Guiard, use a bulbous sound, "sonde exploratrice," with which they first remove the pus from the pars anterior by rotatory movements and repeated introduction, and then pass into the pars posterior. If mucus or pus is then found on extraction, the process is situated in the pars posterior.

A frequently used method, which is based on the fact that the locus morbi in the urethra is sensitive and painful, is examination with the sound or bulbous bougie. If this is introduced slowly into the urethra, the patient not alone feels pain, which always results from the examination and is felt particularly in the membranous portion, but he not infrequently describes a burning or stitch pain in certain fixed points. If the examination has been made several times, and the pain is always localized in the same parts, we will hardly err in regarding these spots as the site of urethritis. If the process is localized in the pars prostatica the passage of this part usually causes a violent, painful tenesmus, and the withdrawal of the sound is followed by the prostatorrhœic secretion. In cases of urethral hyperæsthesia in neurasthenics sounding is very painful. The sound is arrested every moment by spasm of the urethra, passage of the membranous portion is arrested by the spasm, which only subsides at the end of a few minutes, and even the removal of the sound is made difficult from the same cause.

Although examination with the sound only informs us concerning the site of the disease (and this not very reliably), it possesses one advantage over the other methods. If the sound has the largest possible calibre which the meatus will admit, the examination proves that there is no notable narrowing of the urethra.

The chronic foci, consisting of connective-tissue hyperplasia, diminish the elasticity or dilutability of the mucous membrane. This will be so much more marked, the greater the amount of surface and the depth involved, and the greater the transformation into fibrillary connective tissue. In the succulent infiltrations of the first stage the diminution of dilatability is slightest. If the dilatability of the urethra were uniform, its diminution could be demonstrated by every sound which passes the meatus. But this is not so. The meatus is the most rigid part of the entire canal. In order to convince ourselves that the elasticity of the pars cavernosa has not been diminished, we must be able to stretch the bulb to 40–45 Charrière, the pendulous portion to 30–35 Charrière. Hence there may be infiltrations which allow the passage of any sound that is capable of passing the meatus. These infiltrations retract in time and become noticeable when they have reached a smaller calibre than the orifice. Otis calls these wide strictures and believes that there is no chronic urethritis without some, though perhaps slight, narrowing. These stenoses do not always deserve the name stricture, inasmuch as they have not developed from connective-tissue retraction but from infiltration and swelling of the mucous membrane. It is nevertheless certain that even connective-tissue strictures, in their incipiency, may escape our knowledge. Otis and Weir recommend the use of their urethrometer in order to recognize these wide strictures. If the closed instrument is inserted in the normal urethra, the olive or spindle is readily separated in the bulbus to 40–45–50, and in the pendulous portion to 30–35–45. This separation cannot be effected when infiltrations diminish the elasticity of the urethra. If we begin at the bulb and measure the distensibility of the entire urethra, we can obtain data concerning the site of the infiltration by the diminution of the dilatability of the canal in circumscribed spots, concerning the density of the infiltration by the greater or less diminution of dilatability, and concerning the succulence or resistance of the infiltration by the greater or less resistance to further dilatation. If, as happens not infrequently, the dilatability for the urethrometer is not diminished despite a demonstrable lesion in the pars anterior, we have to deal with succulent, very superficial mucous foci.

All these methods give us the situation of the chronic process, but not a picture of it. This can only be obtained by the use of the endoscope, which is often indispensable for diagnosis.

The notion of examining the mucous membrane of the urethra by means of apparatus similar in principle to the vaginal speculum, dates back to the beginning of this century. But the instruments inserted in the urethra have such a narrow lumen and permit the entrance of so little light, that concentration of the rays of the source of light and their reflection

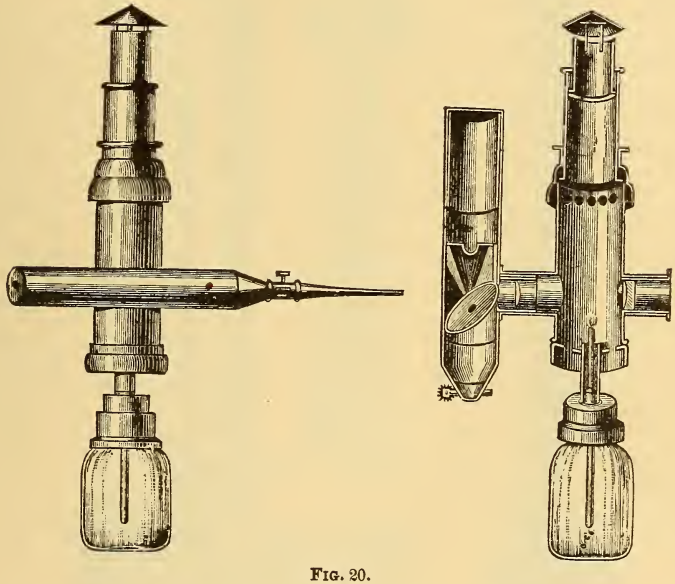


Fig. 20.

in the tube of the endoscope, were made necessary. Segalas was the first who grasped this idea, but Desormeaux was the first to execute it completely. He also founded the pathology of chronic urethritis in a manner which left little to be changed.

Desormeaux's instrument (Fig. 20) consisted of a funnel-shaped urethral tube, at the end of which was fastened the illuminating apparatus. This consisted, in principle, of a perforated reflector, placed obliquely in a tube, and which received its light from a lamp placed on one side, while the eye of the observer looked through the central opening in the mir-

ror. Apart from the weight of the instrument it possessed the disadvantage that it was adapted for study but not for local interference. After a series of changes had been made in the source of light, others made more material changes, the most important of which is the complete separation of illuminating apparatus, reflector and tube; this was first conceived by Hacken. Gruenfeld used for illumination a gas or oil lamp, as reflector a laryngoscopic mirror which can be fastened to the

Fig. 21.

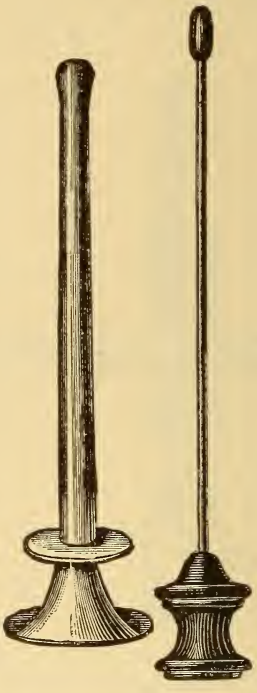


Fig. 22.

forehead, and a series of endoscopic tubes (Fig. 21), long and short, fenestrated anteriorly or laterally, and with the fenestræ either open or closed with plane glass, destined for various parts of the urethra and bladder. Steurer's modification (1876) was a practical improvement of the endoscopic tubes. The Gruenfeld tubes, with a calibre of catheters of 18 to 24 Charrière, pass gradually at the ocular end into a tolerably wide funnel, which is blackened inside like the endoscope, and whose serrated rim serves for the conduction of the instrument. The

introduction of the instrument into the urethra to such a distance as to cause painful distention of the meatus by the funnel is almost unavoidable. Steurer uses shorter tubes (Fig. 22), which render better illumination possible, and then inserts a round plate into the tube at the point where it passes into the funnel. The fixation and conduction are thus facilitated materially, while the plate permits the painless shoving together

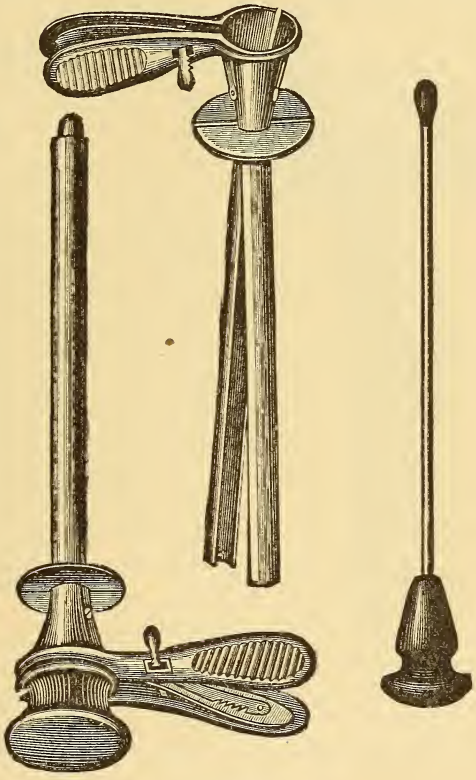


Fig. 23.

of the penis in examination of the deeper parts and thus the use of shorter tubes. In order to make larger parts of the urethra visible, Auspitz (1879) recommended a bi-valve endoscope (Fig. 23), which is inserted with the conductor closed and is then opened, and, being formed after the manner of Cusco's duck-bill speculum, does not distend the orifice. Instead of the ordinary rounded conductors which project

slightly beyond the tube, Schuetz (1886) uses an olive-tipped bougie, which is introduced into the posterior portion of the urethra, and over which the endoscope is inserted. Posner recommends tubes which are bright inside, like Ferguson's speculum, instead of blackened tubes. In order to see larger surfaces of the pendulous portion, Autal devised his aëro-urethroscope, a short endoscopic tube which is applied firmly

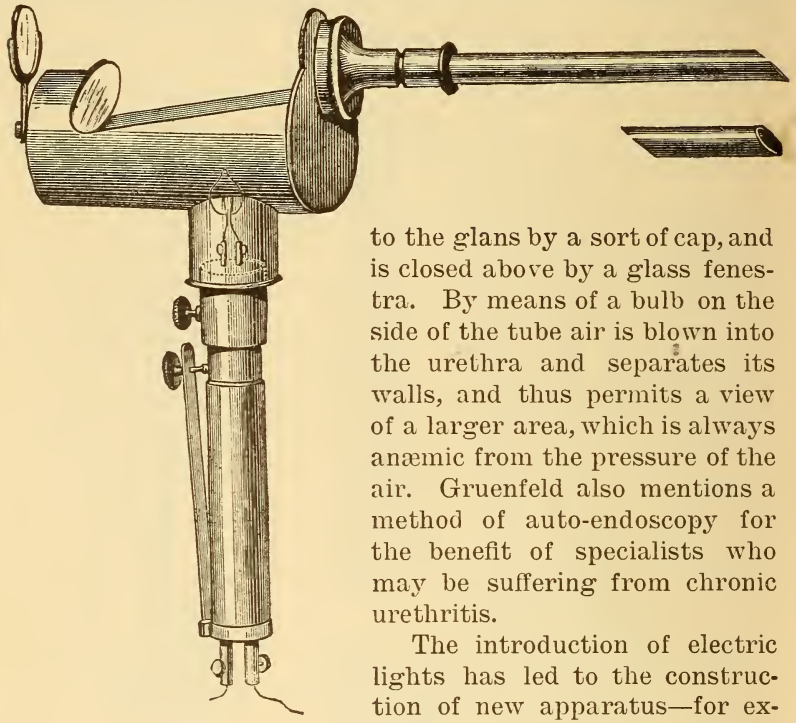


Fig. 24.

to the glans by a sort of cap, and is closed above by a glass fenestra. By means of a bulb on the side of the tube air is blown into the urethra and separates its walls, and thus permits a view of a larger area, which is always anæmic from the pressure of the air. Gruenfeld also mentions a method of auto-endoscopy for the benefit of specialists who may be suffering from chronic urethritis.

The introduction of electric lights has led to the construction of new apparatus—for example, Oberlaender's modification of Nitze-Leiter's instrument. This consists of endoscopic tubes, but the source of illumination, a white-hot platinum wire, is situated at the visceral end within the tube. In order to prevent the conduction of heat from the wire to the instrument and mucous membrane, a thin column of fluid flows around the wire. Although made very compactly the apparatus nevertheless narrows the lumen of the endoscope, apart from the fact that the attention of the examining physician is diverted by the battery and the conduction of water. The source of light is often too vivid, and offers the disadvantages which

always become noticeable when one looks from the dark into a brightly lighted space. Schuetz's diaphotoscope (1887) has the source of light—an arc lamp and reflector—immediately in front of the eye.

The Leiter electro-endoscope constitutes the most serviceable and practical improvement. This returns to the principle of the Desormeaux endoscope. It consists of short endoscopic tubes, fashioned after Steurer's, at whose ocular end is applied the easily-handled illuminating apparatus by means of its funnel-shaped end. The illuminating apparatus (Fig. 24) is connected by two wires with the battery, and consists of an arc lamp and behind it a fixed concave mirror, which throws the rays of light parallel into the funnel and through those into the endoscope. The eye of the observer looks over the rim of the mirror into the funnel, and tampon, brush and other instruments are introduced in the same direction. The vividness of the illumination may be varied by raising or lowering the elements in the cells.

Technique of Endoscopy.—At the present time we use only short straight tubes, like those recommended by Steurer. The introduction of the straight instrument into the urethra is attended with some difficulty for the beginner. The well-oiled instrument should be led along the upper wall of the urethra as far as the bulb, but not pressed too far into it; the ocular end is depressed, with coincident slight pressure upon the visceral end of the instrument, in order to enter the isthmus, and then the instrument pushed forward to the neck of the bladder, *i.e.*, until urine begins to escape between the instrument and conductor when the bladder is moderately full. Slight traction now brings the apparatus immediately in front of the internal prostatic sphincter. The examination of the urethra is always conducted from behind forwards, the conductor being removed and the field of vision cleaned with tampons.

The patient should be placed upon a table (Fig. 25) which is at the level of the eye of the physician sitting in front of it. For examination of the neck of the bladder and pars prostatica the ocular end of the instrument must be depressed considerably. The patient's genitalia must be raised in order to see well. For this purpose it is well to have the lower end of the table movable at an angle by means of a screw. Small

drawers under the table, containing tampons, caustic-holders, etc., render assistants superfluous. The patient lies in the horizontal position with the head slightly elevated, the lower limbs flexed and kept in the most comfortable position by means of the foot rests. The best tampon-carriers are little rods of wood, which can be obtained in match factories. A little cotton is wound firmly around one end and the rod thrown away after being used once. Very serviceable tampon-carriers are also made of firm iron wire, the visceral end, around which the cotton is wound, being filed down and slightly serrated. After using the cotton is burnt in a spirit lamp, thus securing at the same time the best sterilization of the wire.

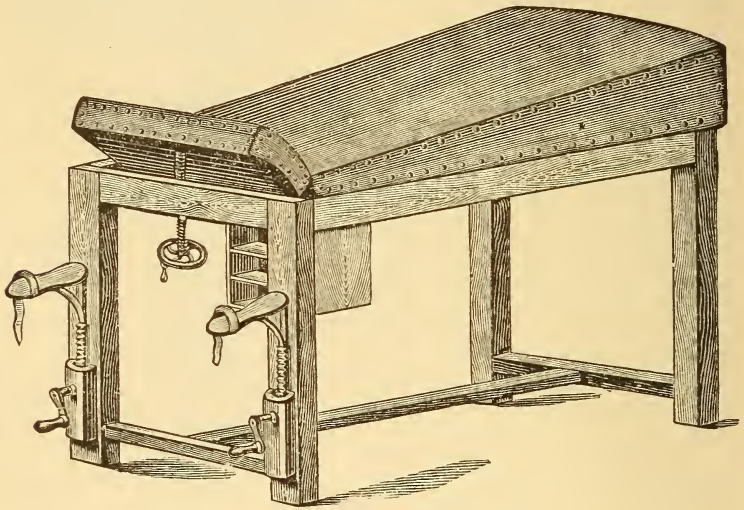


FIG. 25.

In examining the normal urethra we notice, in the posterior portion of the pars prostatica, that the mucous membrane passes from the rim of the endoscope to a quite centrally situated point, in which it comes together like a sphincter and thus forms a short funnel. The color of the mucous membrane is quite dark red, its surface smooth or slightly ridged by delicate longitudinal folds, which all pass towards the apex of the funnel, and are called the "central figure."

As the endoscope is withdrawn the mucous membrane at the apex of the funnel follows, so that the funnel always remains the same. At the same time we notice a gradually

increasing pallor of the mucous membrane. If we withdraw the tube a little, we will notice that, while the funnel remains intact above and laterally, a flat or round protuberance pushes into the lumen of the endoscope from below or often from below and on the left side, and becomes clearly visible on withdrawing a little further. This is the caput gallinaginis, which has a quite uniform carmine color and occupies about three-quarters of the field of vision. To the right and left are two dark furrows; above it the funnel, which is reduced to the shape of a crescent. In favorable cases, especially if the caput is brought entirely into the lumen by lifting the ocular end of the tube, we see upon the prominence the opening of the pocular, like the point of a needle.

On further withdrawal the caput gallinaginis passes backwards, but its prolongation remains visible for a considerable period as a large fold on the lower surface of the funnel. In consequence of the projection of the caput gallinaginis, the central figure forms a short curve, with the convexity above, the concavity below and a little to one side, and which grows constantly smaller from behind forwards. Finally we arrive at a point where the mucous membrane, which gradually grows paler, again forms a complete funnel with punctate central figure, and the mucous membrane is smooth or slightly ridged radially towards the central figure. We are then in the membranous portion. So long as we remain there, the appearance of the short, pale-red funnel is the same. Next follows a spot, which may prove especially confusing to the beginner. On continuing the slow withdrawal we leave the membranous portion. As soon as we are out of the isthmus, the visceral end of the endoscope enters the field of activity of the bulbo-cavernosi and ischio-cavernosi muscles, which push it upwards with rapid contractions. In order to counteract this movement, which may even expel the instrument if held too lightly, it is sufficient either to lift the ocular end and to carry on the further conduction of the endoscope in the same way as a catheter (in a curve directed towards the abdominal walls), or the visceral end of the instrument must be kept below the symphysis by pressure from without. The action of the bulbo-cavernosi and ischio-cavernosi muscles is visible in the endoscope. The funnel hitherto formed by the mucous membrane disappears. The contraction of the muscles which are situated on the sides of

the urethra, pushes the mucous membrane into the endoscope in the shape of two lateral ridges, which touch in a vertical fissure in the middle of the field of vision. This picture persists throughout the entire pars bulbosa, except that the vigor of the muscles, and hence the width of the ridges, diminishes anteriorly. In this situation the color of the mucous membrane is subject to the greatest variations; it may be entirely anæmic as the result of pressure, but is normally of a pale flesh red. On careful examination of one or the other wall we can see not infrequently the Morgagni's lacunæ as dark spots surrounded by a narrow ring of darker red mucous membrane.

On passing into the pendulous portion the funnel of the very pale red mucous membrane again appears. This funnel is so much longer the more the pars pendula is stretched, and in this way a large portion of the mucous membrane may be brought into view. Radial folds are not infrequent, and Morgagni's lacunæ are often visible.

With regard to the appearances in chronic urethritis the endoscope possesses the great advantage that it allows us to recognize not alone the site of the changes but also their nature. The endoscopic picture is essentially the same in pathological cases as in the normal, but undergoes certain modifications from the swelling and infiltration of the mucous membrane. When it forms a funnel with a punctate central figure, the funnel will suffer in all its dimensions by the uniform succulent swelling, and will become narrower and shorter. If the swelling is very considerable, the mucous membrane will even project into the tube, and the funnel will start from this projection; it is therefore very small, narrow and low. If there is rigid, though uniform, swelling of the mucous membrane, the latter will not come in contact so rapidly, and the funnel will be longer and higher. Unequal, unilateral or disseminated infiltrations and swellings will make the funnel unsymmetrical; swollen folds appear distinctly and disturb the punctate shape of the central figure, which is distorted, oval, or formed of several contours which are convex internally. Where no funnel is formed, but the mucous membrane is ridged, as in the bulb, the ridges project into the tube to a greater extent if the swelling is succulent, but are not prominent if the swelling and infiltration are rigid. Indeed, it is found not infrequently that no ridges are formed, and the mucous membrane incloses the field of vision like the wings of the stage.

The changes in the surface consist, in the first place, of differences in color. Various shades from red to dark red and bluish red may be found diffused or disseminated in different parts of the urethra.

The surface may also appear changed, apart from the color. It may look smooth and shining in the diseased parts, but more frequently it has a dull look. In many cases it is seen that this dull appearance depends on epithelial losses, which give the surface a finely stippled appearance. Or the surface shows a velvety roughness. In still others it is cloudy, looks swollen, has lost the smoothness of normal mucous membrane, and is covered with a large number of dark-red grains, which may be uniformly of the size of small grains of sand, or they are unequal, with a pointed, conical or round top, and present the appearance of a mulberry or a granulating wound. This change, known as granulation, may occupy large surfaces or appear as small, circumscribed patches. Certain circumscribed affections also occur, as swelling of Morgagni's lacunæ, with erosion of the vicinity of the excretory ducts, intense redness, irregular superficial ulcerations, and patches of thickened and opaque epithelium. Finally, in addition to the previously described granulations (which often attain considerable dimensions from loosening of the tissues and fungous proliferation), are found true trachomatous granules, which are succulent, and shine through the delicate mucous membrane like frog spawn (Gschirhakl, 1878; Gruenfeld, 1880).

We thus have a picture of great diversity, which is so much greater because all the changes mentioned may be present in the same urethra. But certain changes are found mainly in certain portions of the canal.

If we examine the urethra in these cases from behind forwards, we will find at the neck of the bladder, in addition to a very small, or, as the result of rigid infiltration, very wide and high funnel, that the mucous membrane has a deep livid redness, the folds which radiate from the central figure are more distinct, here and there (usually isolated) a larger erosion, which bleeds at once when touched with the tampon. In cases of chronic prostatic urethritis the caput gallinaginis is considerably swollen, the mucous membrane livid and velvety, and pressure with the tampon causes violent pain. The pallor of the remainder of the mucous membrane usually contrasts

with the dark redness of the caput gallinaginis. I have never found granulations in the pars prostatica, but Desormeaux describes them.

In the membranous portion we usually find only swelling, redness and small erosions. Granulations occur not infrequently in the anterior portion, but their proper territory is the bulb, which they often fill in great measure. The pendulous portion presents the most manifold picture. Patches of granulations and thickened and cloudy epithelium alternate with simple catarrhal swelling, redness, and erosions.

For this reason it is inadvisable to divide chronic urethritis into urethritis simplex, granulosa, trachomatosa, etc. All the changes seen by us in chronic urethritis are phases of one and the same process, which may occur together or follow one another. This is explained by the fact that the process has its sites of predilection to which it is chiefly confined and in which it reaches its highest development, while in other places it does not run such a severe course or is complicated by secondary changes.

We will now give a brief résumé of the method of examination which I have found to be practical.

If a patient tells us that he is suffering from chronic urethritis, we first take the previous history (duration, frequency of infection, etc.), inquire concerning previous complications (cystitis, epididymitis, prostatitis) and other symptoms such as prostatorrhœa, spermatorrhœa, sexual weakness and impotence. We then examine the patient. Any secretion which may be squeezed from the urethra is placed on the object glass, dried, stained, and examined microscopically for gonococci and leucocytes. The patient then urinates in two portions. Cloudy urine with clap shreds indicates more recent urethritis. If the second portion is also slightly cloudy, or if the second portion is clear but contains Fuerbringer's comma-shaped hooklets, then posterior urethritis is undoubtedly present. If the first urine is cloudy, or if it is clear but contains clap shreds, while the second portion is entirely clear, then localization is impossible for the present.

The patient is directed to report upon the following day and to retain the urine several hours prior to his visit.

At this second visit we perform the irrigation test. The shreds in the irrigation water are reserved for microscopical

examination. If the shreds are found only in the former but are absent from the urine passed after irrigation, the case is one of anterior urethritis.

Examination with the urethrometer then shows whether the lesion is superficial or deep.

If shreds are found in the urine after washing out the pars anterior, *i.e.*, in case of posterior urethritis, the differentiation between a purely mucous process or coincident affection of the prostate is shown by the presence or absence of prostatorrhœa, spermatorrhœa and impotence. In the latter event examination of the pars posterior with the bougie à boule will disclose any enlargement of the caput gallinaginis which may be present, and examination (as regards pus) of the secretion evacuated on the bougie or after pressure upon the prostate through the rectum (performed immediately after micturition) may amplify the diagnosis by disclosing catarrh of the prostatic glands.

Pathological Anatomy.

The nature of chronic urethritis, like that of the acute form, long remained obscure. Thus, Swediaur (1798) regarded the prostate as the site of gleet and the secretion as an unnatural discharge of the mucus of this gland. Girtanner (1803) regarded gleet as a weakness of the mucous glands.

Desruelles (1854) had the opportunity of making an autopsy on an old man who died of pleurisy and had suffered for twenty years from chronic urethritis. He found a number of yellowish-white granulations, which were situated mainly in the membranous portion; the remaining mucous membrane of the urethra was delicate, pale and thin. According to Civiale, his pupil Lewy had observed (1850), in an autopsy on a stricture patient, numerous fine, dirty gray granulations in the prostatic portion behind the stricture; but little attention was paid to these appearances.

Desormeaux (1865) described the appearances in chronic urethritis from his examinations in the living, and called especial attention to the granulations. As an adherent of Thiry's (1840) doctrine of a "virus granuleux," he regarded them as a characteristic not alone of chronic but also of acute blenorrhœa. In addition to red granulations, like those of proud

flesh, Desormeaux described gray granules like those of trachoma.

Soon afterward Cullerier reported two autopsies on old urethritides. In the first case, a young man who had died of typhoid fever and was said to have suffered only thirty-three days from clap, there was dark-violet redness of the entire anterior part of the urethra, where the mucous membrane was thickened and rough. On the lower wall of the urethra, in the pars prostatica, he found about twenty small red nodules, surrounded by a circle of injected capillaries, exactly like the granulations found on the ocular conjunctiva. Similar changes were seen in another case of urethritis two months old.

Fauconnier was the first to furnish a detailed account of an autopsy in a man, æt. thirty-two years, who entered Guyon's wards on January 15, 1877, suffering from a chronic urethritis of seven years' standing and a recent syphilis. He died of facial erysipelas. Examination of the urethra (Plate V., Fig. 12) showed: at the neck of the bladder, near the caput gallinaginis, the mucous membrane was whitish, non-vascular, as if cicatrized. The caput gallinaginis was enlarged and thickened. Pressure on the ejaculatory ducts discharged prostatic secretion mixed with pus. In the membranous portion the mucous membrane appeared pale, smooth, like a cicatrix, and traversed by longitudinal vessels. The mucous membrane of the bulb is sharply defined posteriorly, while anteriorly over a surface of about 6 centimetres it is uneven, dull, eroded in some places, congested, covered with extremely fine, whitish granulations, which are especially dense in the bulb and resemble a granulating wound. The pars cavernosa is normal except a strongly injected portion anteriorly, about 5 centimetres long. No trace of narrowing or fibrous thickening in the entire urethra. Microscopical examination of the granulations showed small cell infiltration.

Soon after appeared two interesting examinations by Vajda (1882). In two cases of old chronic urethritis, in one of which a stricture and peri-urethritis were also present, he observed: 1. Thickening of the epithelium, attended with flattening, so that the cylindrical epithelium of the urethra finally disappeared entirely. 2. The newly formed epithelium masses are collected especially at the apices of newly formed hypertrophic papillæ and protuberances, which formed excrescences and

Fig.12.

LINDNER, EDDY & CLAUSS, LITH. N. Y.

finally papillomata. 3. The papillomata and epithelial thickenings increased in the deeper parts of the urethra. 4. The connective tissue around the urethra is infiltrated.

In the Atlas des maladies des voies urinaires of Guyon and Bazy are found two cuts of anatomical preparations of chronic urethritis. In one the urethra is normal as far as the bulb. Here the mucous membrane is congested and slightly excoriated, sharply defined posteriorly, but gradually merging anteriorly into normal membrane. In the second case granulations and small ulcerations are found in the bulb, but gradually disappear anteriorly.

In Gosselin's case, reported by Gueillot, the fossa navicularis and the bulb were found affected. In the latter the mucous membrane was violet in color, traversed by dendritic vessels, which gradually disappeared anteriorly.

In Prof. Weichselbaum's laboratory I have recently made numerous histological examinations of the male urethra in a condition of chronic urethritis, and will here give a résumé of the results:

I. Anatomo-Pathological Changes of the Pars Anterior.

The hyperæmia, serous swelling and infiltration, which are observed with the endoscope so often during life, either disappear post mortem or become less recognizable.

There are, however, numerous macroscopic changes. The epithelium exhibits changes which vary from slight opacity to considerable thickening and whitish discoloration; the latter condition often simulates superficial cicatrices. Losses of epithelium are much rarer than thickenings, and are usually superficial and isolated. I never found extensive erosions or ulcerations.

The changes in the subepithelial tissue, the swelling and infiltration which depend upon hyperæmia, are indistinct on account of the disappearance of the hyperæmia. Only one group of cases exhibited changes of the surface which were due to swelling. In circumscribed spots the surface appeared finely ridged, uneven, containing small nodules whose size varied somewhat. These were undoubtedly granulations, as was shown by the microscopical examination.

There are striking changes in Morgagni's lacunæ. On section of the normal urethra these are invisible or appear as very fine dots. In a series of cases of chronic urethritis the openings are as large as the head of a pin and with the surrounding parts may be elevated like a crater. In another group of cases the lacunæ are absent, and they are replaced by milky-white nodules, which are imbedded in the mucosa.

With the unaided eye it is often impossible to distinguish cicatrices from simple epithelial thickenings. This is particularly true of ridge- and net-shaped, slightly elevated strictures, which are formed in part by epithelium, in part by subepithelial connective tissue.

Non-constricting, depressed, eccentrically retracted callosities are not infrequent. Examination shows that they are always very superficial and due to changes in the uppermost layers of the subepithelial connective tissue.

There are numerous interesting microscopical changes. In a series of cases the epithelium still retains its normal arrangement, but the uppermost layer of cylindrical cells is loosened and in a condition of mucoid degeneration. The transition cells, consisting normally of one or two rows, are often spread over many rows (Plate VI., Fig. 13, *a*). Numerous pus corpuscles are imbedded between the cylindrical and transition cells. Another interesting change is the transition of cylinder into pavement epithelium. Three types of pavement epithelium may be distinguished:

(*a*) It resembles that of mucous membranes with pavement epithelium, *i.e.*, it consists of an undermost layer of cubical cells, several layers of polygonal, and an upper layer of pavement epithelium.

(*b*) The epithelium is epidermoidal, consists of a lower layer of cubical cells, followed by several layers of polygonal or spindle-shaped cells analogous to the rete Malpighii; these cells constantly grow larger and flatter towards the surface (Plate VI., Fig. 15, *a*).

(*c*) The epithelium is like that over cicatrices and consists of several layers of very flat pavement epithelium (Plate VI., Fig. 16, *a*).

This conversion of cylindrical into pavement epithelium, which causes a xerosis of the mucous membrane, is connected with the changes in the subepithelial connective tissue. Thus

Fig. 13.

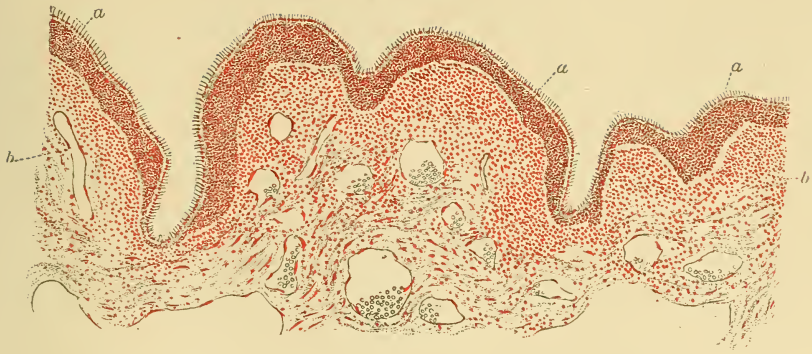


Fig. 14.

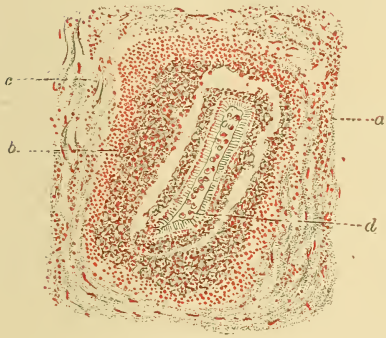


Fig. 15.

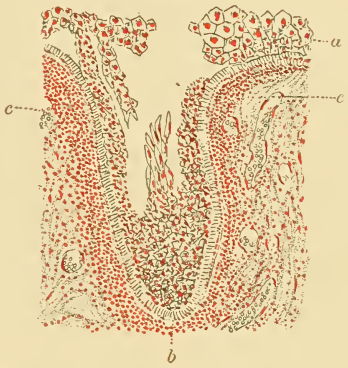
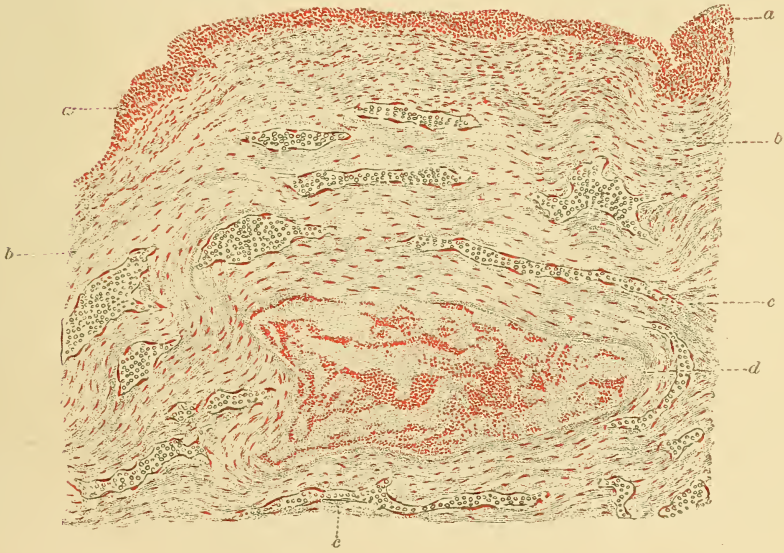


Fig. 16.



the first type of cells is found over recent round-cell infiltrations, the second type over older ones, the third form exclusively over firm connective tissue.

The subepithelial connective tissue exhibits the most important changes, and is the site of the chronic inflammatory process proper. This consists of an infiltration of the connective tissue, which has a decided tendency to transformation into retracting connective tissue. In the more recent cases we find that the subepithelial connective tissue, sometimes only in the upper layers, sometimes extending even into the corpus cavernosum, contains a loose or dense infiltration, consisting of mononuclear and epitheloidal cells, sometimes mixed with pus cells. This infiltration surrounds the lacunæ and glands imbedded in the subepithelial tissue, hence it is also perilacunar and periglandular.

In a group of cases the cellular infiltration contains numerous, evidently new formed, very wide blood-vessels. These two factors, viz., the infiltration and the blood-vessels, give to the subepithelial connective tissue that papillomatous appearance, that mulberry-like condition of the mucous membrane in places which we described as granulations (Plate VI., Fig. 13, 6). The infiltration consists at first of round and epitheloidal cells; as it grows older the spindle cells become more abundant. The interfibrillary tissue becomes denser and firmer, and there finally results a tissue which resembles a cicatrix anatomically. It is not due to ulceration but to chronic connective-tissue hyperplasia. The granulations which may have formed during the recent stage are flattened by the retraction and a callosity results. This corresponds to the infiltration of the first stage; it is always circumscribed, sometimes located superficially in the uppermost layers of the subepithelial connective tissue, sometimes it extends deeply, even into the corpus cavernosum (Plate VI., Fig. 16, *b*).

The stage of infiltration and of cicatrization may be complicated temporarily by exacerbation of acute inflammation and emigration of leucocytes.

The lacunæ exhibit changes analogous to those in the mucous membrane. The epithelium shows desquamation of the cylindrical cells, proliferation of the transition cells, transformation into pavement epithelium (Plate VI., Fig. 15, *a*). The infiltration in the perilacunar tissue often raises the lacunæ and

dilates their lumen. If the infiltration in the connective tissue retracts, the lacunæ will become atrophic and disappear. Not infrequently the outlet is first narrowed, and the lacuna is then converted into a little cyst, filled with pavement epithelium.

Littré's glands, which are situated in the meshwork of the corpus cavernosum, exhibit two kinds of changes. In one the change is periglandular; the small-celled infiltration of the subepithelial connective tissue around the excretory ducts of the glands draws them downward and surrounds the gland and its duct. The excretory duct also exhibits epithelial changes which imitate those found upon the free surface, viz., the three types described above. Special interest attaches to the second type, in which the epithelium resembles that of the rete Malpighii. This is developed excessively in the excretory ducts, even extends into the body of the gland (Plate VI., Fig. 14, *a*, *b*), pushes beneath the secreting glandular epithelium and leads, by compression, to destruction of the acini. The secreting epithelium merely exhibits passive changes, viz., destruction by the periglandular infiltration, which penetrates into the network of the acini.

Exacerbations of acute inflammation with emigration of pus corpuscles can also be demonstrated in the glands and their excretory ducts.

In a number of cases the corpus cavernosum is entirely intact. It may also take part in two ways in the chronic inflammatory process.

In one series of cases the chronic infiltration remains in the main superficial. It only enters the corpus cavernosum along the excretory duct and around the bodies of Littré's glands. This periglandular infiltration compresses not only the glands, but the adjacent spaces of the corpus cavernosum are also drawn into the retraction process. The corpus cavernosum then appears to be traversed by an entire series of cicatricial connective-tissue bands (Plate VI., Fig. 16, *c*).

In another series of cases the chronic infiltration, which occupies the entire thickness of subepithelial, periurethral tissue, also penetrates the corpus cavernosum; here it remains superficial or occupies its entire width. In the first stage of the small-celled infiltration the trabeculæ of the corpus cavernosum appear enlarged and infiltrated with numerous round

(later spindle) cells. If this infiltration, which is always circumscribed, undergoes retraction, the mucosa and corpus cavernosum are converted into a firm, retracting callosity. These deep-spreading callosities are the causes of stricture.

Wassermann and Hallé (1891) have confirmed these findings, and we are therefore warranted in defining stricture as the result of chronic cirrhotic periurethritis and cavernitis, which complicate chronic urethritis.

Hence we must distinguish, in the pars anterior, two forms of the chronic process: a purely mucous, superficial form, which results in superficial, non-constricting, excentrically retracting cicatrices, and a second form, in which the process extends to the periurethral tissue and corpus cavernosum and thus leads to stricture.

II. The Anatomo-Pathological Changes in the Pars Posterior.

In the dead body this is characterized macroscopically by loosening of the mucous membrane of the urethra within the pars prostatica. In some cases this gives to the mucous membrane a speckled look, in others it leads to the formation of delicate papillary excrescences which impart a villous appearance.

This papillary condition of the mucous membrane is usually most marked around the caput gallinaginis and also extends to the latter but is gradually lost upon its sides. It also diminishes posteriorly towards the bladder and never reaches the vesical orifice.

In other cases the mucous membrane shows thickening, callous degeneration, formation of firm connective tissue.

The caput gallinaginis shows interesting changes. It is usually enlarged, often to a marked degree. This enlargement is uniform. In only one case was it irregular and then consisted of numerous nodules with intervening shallow depressions.

In a series of cases the mucous membrane of the caput gallinaginis appeared loose, stippled, and also papillated upon the sides. In others it was rigid and callous.

I directed special attention to the prostatic secretion. After laying the urethra open, I expressed this secretion from

the prostatic duct by pressure upon the prostate. In six cases this secretion was thin, milky, and normal macroscopically as well as microscopically.

In another group of six cases the secretion was thicker in consistence, more abundant, and had a milky-white color.

Microscopical examination permitted a division of these cases into two groups:

1. In one group the prostatic secretion, which is otherwise normal, contains an unusual number of epithelial cells (cylindrical, cubic, polygonal).

2. In the second group the secretion also contains a layer or smaller number of polynuclear leucocytes (pus cells).

The anatomo-pathological changes in the mucous membrane of the pars prostatica around the caput gallinaginis were analogous to those which I described as found in the pars anterior. The process essentially runs its course in the upper layers of the subepithelial connective tissue, and is a chronic inflammatory process with a first stage of small-cell infiltration and connective-tissue proliferation, and a second stage in which cirrhotic connective tissue forms.

The small-celled infiltration of the first stage is usually loose. In only one was it unusually dense, and the intensity of the inflammatory process then gave rise to miliary superficial foci of necrosis (Plate VII., Fig. 17, *a*, *b*).

As a transition between the two stages there occurred in a few cases an outgrowth of the infiltrated connective tissue into small conical papillary excrescences, containing numerous newly formed vessels.

The second stage remained superficial and did not lead to noticeable shrinking.

The accompanying changes in the epithelium were: proliferation and desquamation of the cylindrical epithelium in the first stage, and conversion of the cylindrical epithelium into several layers of pavement epithelium in the second stage.

The glands of the urethral mucous membrane, which are imbedded in the first stage in the subepithelial infiltration, take part in the inflammation in the shape of desquamative or desquamative purulent catarrh. In the second stage they are compressed and destroyed by the transformation of the infiltration into cirrhotic connective tissue.

Fig. 17.

Fig. 18.

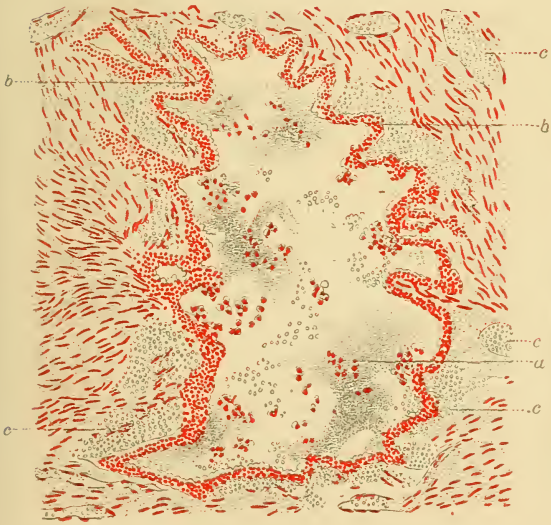


Fig. 19.

The changes in the caput gallinaginis, ejaculatory ducts and prostatic glands merit special consideration.

In the caput gallinaginis, as in the chronic inflammation of the urethra, the process runs its course in the well-known two stages of small-celled infiltration and the formation of callosities. In one case the small-cell infiltration was unusually dense, and, as in the case of the urethra, miliary foci of necrosis were produced (Plate VII., Fig. 17, *a*, *b*). The natural result of this infiltration is enlargement of the caput gallinaginis. This enlargement was uniform in all cases except in one, in which it was nodular. The nodules were due to circumscribed foci of acute inflammatory infiltration by polynuclear leucocytes in connective tissue, which was in a condition of chronic inflammation.

Corresponding to the two stages of small-celled infiltration and the formation of callosities, there was found in one series of cases catarrhal desquamation of the cylindrical epithelium, in another series conversion of the cylindrical into pavement epithelium.

Much interest attached to the callosities observed upon the caput gallinaginis, and which consisted of cirrhotic connective tissue and pavement epithelium. One of these callosities was located, like a depressed umbilication, upon the apex of the caput. In a second case it was situated on the side of the caput, entered deep into its tissues, and obliterated the opening of the ejaculatory duct. In two cases band-shaped depressed callosities passed over the highest point of the caput, obliterated both ejaculatory ducts and the utriculus, and divided the caput into two nodules.

These callosities probably had different sources of origin.

The one mentioned second, in which the microscope showed the presence of glandular tissue at the margin, was probably due to a follicular abscess in the acute stage of gonorrhœa. Such abscesses are found not infrequently, in acute posterior urethritis, as nodules of the size of a pea in the otherwise normal tissue of the prostate.

The other three umbilicated or band-shaped callosities can be explained most readily by superficial necrosis of the dense subepithelial infiltration, and this was actually observed in one case.

In a number of cases the chronic inflammatory process

which has just been described is confined to the uppermost layers of the subepithelial connective tissue.

In a second series of cases the process penetrates into the substance of the caput gallinaginis. This does not take place uniformly but only alongside the glands and their excretory ducts. The ejaculatory ducts may be affected in various ways by the inflammatory process. In the superficial forms only the mouth of the duct is affected by the infiltration, which compresses or narrows it. I can hardly be mistaken in attributing the pains, of which many patients complain at the moment of ejaculation, to this compression of the opening of the ejaculatory duct.

The infiltration of the upper layers of the subepithelial connective tissue may also extend along the ejaculatory duct into the deeper parts. Disease of the wall of the duct then takes place in the well-known two stages. In the first stage the subepithelial connective tissue around the duct is surrounded by a small-celled infiltration which accompanies it through the caput gallinaginis into the prostate. If this infiltration is converted, in the second stage, into cirrhotic connective tissue, the wall of the duct becomes rigid.

The walls of the ejaculatory duct, especially within the prostate, contain numerous diverticula, which empty into the duct in the direction of the ejaculated semen. In two cases I found these diverticula, deep in the prostate, filled with numerous spermatozoa. At the moment of ejaculation the semen cannot enter the diverticula, which empty into the duct at an acute angle to the direction of the current. This can only be effected by a return movement, by a regurgitation of the semen into the diverticula. This, in turn, will only happen if the force by which the semen is ejaculated is broken by constriction of the mouth of the ejaculatory duct or by rigidity of its walls. As a matter of fact, compression of the duct by subepithelial infiltration was found in one case, a callous condition of the walls of the duct in the second case.

Semen which has entered the diverticula (during coitus or pollutions) may be expressed during subsequent micturition or defecation. Rigid ejaculatory ducts close the seminal vesicles imperfectly, and these findings thus explain the spermatorrhœa which is so frequent in chronic posterior urethritis.

After cicatricial occlusion of the mouth of the ejaculatory

duct, the latter is very much dilated and its diverticula are destroyed entirely or in part. The surrounding blood-vessels are very much dilated. I also found hemorrhages beneath the epithelium and even into the lumen of the ducts (Plate VII., Fig. 18).

The infiltration of the subepithelial tissue may also extend periglandular around the glands within the prostate, but only in the superficial glands of the caput gallinaginis. The infiltration is then localized particularly in those parts of the periglandular connective tissue which separate the individual tubuli and project as villi into the lumen of the glands. These villi are infiltrated, elongated, lose their epithelium and adhere to one another, so that the tubuli are occluded and a section of the gland exhibits an acinous appearance.

Changes in the glandular epithelium are even more frequent, and may be divided into two classes.

In one group microscopic examination shows dense filling of numerous glands and tubuli with proliferated and desquamated epithelial cells (*i.e.*, a purely desquamative catarrh) while other glands appear perfectly normal. These were the cases in which the prostatic secretion attracted attention by its amount, white color, and its consistence, but the microscope showed merely a striking increase of the epithelial elements.

In the second group, the lumen of numerous glands contained larger or smaller numbers of polynuclear leucocytes, in addition to desquamated epithelium (Plate VII., Fig. 19, *c*). This was a desquamative purulent catarrh of numerous prostatic glands. In these cases the secretion expressed from the prostate was abundant, milky-white, and in addition to the normal elements also contained numerous pus corpuscles.

This desquamative or purulent catarrh of the prostatic glands is the undoubted cause of the symptoms of prostatorrhœa which are so frequent in chronic posterior urethritis.

If we now make a résumé of my anatomical investigations of chronic urethritis of the pars anterior and posterior, the following conclusions may be drawn:

1. Chronic urethritis is a focal process, which runs its course as a chronic hyperplasia in the subepithelial connective tissue. Disease of the epithelium and glands is to be regarded in part as a complication, in part as a sequel.

2. The foci of chronic blenorrhœa are localized preferably in the pendulous portion, the bulb, and the prostatic portion.

3. The membranous portion is relatively immune to the chronic process.

4. In a series of cases the foci of chronic inflammation in the pars anterior and posterior are situated superficially in the mucous and the subepithelial connective tissue.

5. In another series of cases these foci extend by continuity to the submucous tissue, in the pars anterior to the periurethral and cavernous tissue, in the pars posterior to the prostate.

6. This results in complicating focal processes, chronic periurethritis and cavernitis in the pars anterior, prostatitis in the pars posterior.

7. Hence arises the following classification of chronic urethritis:

I. Chronic anterior urethritis.

a. Superficial anterior chronic urethritis.

b. Deep anterior chronic urethritis (*i.e.*, plus chronic periurethritis and cavernitis).

II. Chronic posterior urethritis.

a. Superficial chronic posterior urethritis.

b. Deep chronic posterior urethritis (*i.e.*, plus chronic prostatitis).

As a matter of course, mixed forms are frequent, *i.e.*, various foci in the pars anterior and posterior.

Finally, the relation of gonococci to chronic urethritis is extremely obscure. According to Bumm, relapses of acute urethritis are owing to the fact that the gonococci, in the last stage, push up from the deep parts through the new-formed epithelium, and are compelled to more superficial growth in the uppermost epithelial layers. If no noxious influences intervene, the upper layers of epithelium, which contain the gonococci, are exfoliated and the process then appears to be ended.

At this time the inflammatory process is disappearing in the papillary stratum. But if any external morbific cause intervenes, the process undergoes an exacerbation. Extravasation of lymph fluid and pus cells occurs, and this fissures the compact epithelial layer. Through these fissures the gonococci again penetrate to the papillary body, and produce irritation with acute suppuration, *i.e.*, a relapse. The virulence

of the gonococci is weakened by their long proliferation upon the same soil for many generations. As a proof we may mention the fact that chronic blenorrhœa is often conveyed as chronic, much more rarely as acute blenorrhœa. The fact that each succeeding relapse is milder and shorter also indicates that the irritation of the papillary body by the gonococci gradually diminishes. The first relapses will always terminate by the removal of the gonococci to the surface, but the virulence may finally be diminished to such an extent that the acute purulent symptoms on renewed invasion of the papillary body no longer suffice to carry the gonococci to the surface. They will then remain in the papillary body, perhaps also in the follicles, and by their constant slight irritation give rise to the chronic proliferating processes in the mucous membrane.

The conveyance of these enfeebled gonococci would explain the ab initio chronic infection in the female, and their proliferation in the deep layers enables us to understand the fact that gonococci may or may not be found in the secretion, the clap shreds.

But the chronic changes induced by the gonococci may develop further after the cocci have perished from any cause. This explains the fact that in certain chronic blenorrhœas we find the secretion and clap shreds but no gonococci. Perhaps certain changes which develop in the course of chronic blenorrhœa—for example, the formation of connective tissue, which gradually becomes more and more fibrous—may be the direct cause of death of the gonococci, and therefore we often do not find the cocci, at least in the secretion, in old blenorrhœas which are complicated by stricture. But this is pure hypothesis, which, although plausible, is lacking in demonstration.

Diagnosis and Differential Diagnosis.

The diagnosis of chronic urethritis is evident from its symptomatology, and we will refer, therefore, merely to a few factors which are especially important in diagnosis.

The most frequent symptom from which the layman makes the diagnosis is the "good morning drop."

But the presence of the drop is not a positive indication of chronic urethritis, nor does its absence exclude such a diagnosis.

A secretion which is characteristic, whether it appears as

a drop or as the co-ordinate clap threads, must contain two morphological constituents. In the first place the secretion must contain pus cells. A secretion composed of epithelium alone is not blenorrhagic, although it may persist for a long time after the clap has run its course.

The gonococci are the second morphologically important element. We have described their characteristics and have also shown that they are not found constantly in chronic urethritis.

In this regard there are three possibilities: The gonococci may be present in such numbers and arrangement that they permit a diagnosis at once.

Or they are absent or present in such small numbers that doubt in the diagnosis is justified. More intense suppuration should then be produced by an injection of nitrate of silver or corrosive sublimate. This produces pus cells, enclosing characteristic cocci groups, and the diagnosis becomes clear.

Finally there are cases in which no cocci are found, even after profuse suppuration is produced. Nevertheless these may be cases of chronic urethritis from which the gonococci have already disappeared. The demonstration of the purulent nature of the secretion, the history of one or more previous urethritides, examination with the urethrometer, the sound and endoscope, and the demonstration in this manner of a circumscribed chronic inflammatory patch, permit a diagnosis to be made even here.

If the question of the presence of blenorrhœa has been answered in the affirmative, then its acuteness is to be determined by the finding of mucus in addition to pus or the absence of the former. Cases in which in addition to the pus (drop or clap threads) there is also mucous cloudiness in the urine, are the more recent, acute, less sharply circumscribed ones, in which, apart from the circumscribed chronic inflammation, there is also congestion and hypersecretion of larger areas of the mucous membrane. Those cases in which only clap shreds are found in otherwise clear urine are older affections, in which the process is sharply confined to one or a few diseased spots.

With regard to all these questions the morning urine is particularly to be examined.

To one point, however, I desire to call special attention. It has often been claimed that the test of the two beakers

permits a differentiation between chronic anterior and posterior urethritis. This is not true. The test is based upon the fact that secretion formed in the pars posterior will regurgitate into the bladder and mingle with the urine. This does not happen, however, with the small quantity of tough secretion (clap shreds), even when formed in the pars posterior. These threads always appear in the first portion of urine. The second portion is clear, whether the case is an anterior or a posterior urethritis. In rare cases shreds may appear in the second portion under the following conditions:

1. If the patient does not discharge sufficient urine in the first portion, it will be unable to wash away all the shreds and some will enter the second portion.

2. After prolonged retention and when the desire to urinate has been experienced for some time, in cases of posterior urethritis. The pars prostatica will then be included physiologically in the bladder in order to receive the urine, the secretion of the former will fall into the bladder, and will be demonstrable in the second portion of urine.

3. When the shreds do not come from the mucous membrane but from the prostatic glands or their excretory ducts (Fuerbringer's hooks). These are expressed during the evacuation of the last drops of urine.

In this connection it is to be noted that all secretions which originate in canals that empty into the side of the urethra (prostate, seminal vesicles) are discharged with the last drops of urine and are found accordingly in the second portion.

We next consider the question of localization and the nature of the changes.

The symptoms which furnish data concerning the situation of the process have already been considered.

We first examine the second portion of the morning urine for mucous cloudiness and comma-shaped shreds from the prostate, phenomena that favor the diagnosis of chronic posterior urethritis.

If this examination gives negative results, irrigation of the pars anterior by means of an elastic catheter introduced as far as the bulb will furnish information concerning the derivation of the shreds. If the urine passed after irrigation is free from shreds, the latter are derived from the pars anterior alone; if it contains shreds, they are due to posterior urethritis.

Inquiry is then made for all those symptoms which usually accompany this form. Without putting any leading questions we often obtain important positive statements concerning prostatorrhœa, disturbances in micturition and the sexual functions.

In addition to data obtained in this way, instrumental examination with the sound, urethrometer, and endoscope will furnish information concerning the location and nature of the changes.

When shall instrumental examination of the urethra be made?

According to my experience not until the process has really become localized. So long as mucous cloudiness of the urine is still present, the instrumental exploration should not be practised. We must first combat the congestive condition which causes the secretion. If instrumental examinations are made at a time when the congestion and mucous secretion are still present, the increased inflammation is apt to convert the mucous secretion into a purulent one, which may last for weeks. More or less numerous gonococci are then usually found in the pus.

Exploration with the urethrometer and sound is the milder of the modes of examination, and is therefore to be employed first. I agree entirely with Tarnowsky that the endoscope is to be used only in those patients who have been examined several times with the sound and have become accustomed to the irritation. The latter often furnishes us with sufficient information concerning the site of the affection.

The endoscope is always absolutely indicated when a chronic localized blenorrhœa resists instrumental measures, and does not recover despite local treatment. Despite the use of the endoscope, examination with the urethrometer should never be neglected. It alone gives us positive information concerning the diminution of dilatability, and thus concerning the density and depth of the infiltration and the degree of conversion into fibrillary connective tissue.

Examinations with the endoscope should be made only by the specialist, as it may readily produce injury to the canal. Larger calibres are always to be recommended, and I never employ less than 22 Charrière. If the meatus is narrower I prefer to make the slight operation of division rather than to

deceive myself and the patient with the uncertain results of examination with 18 or even 16 Charrière. Careful examination usually furnishes valuable information, and the discovery of the infrequent polypi can only be made with the endoscope.

From a differential diagnostic stand-point it must be remembered that not every drop which is squeezed out of the meatus is blenorrhagic pus. We must first ask concerning the appearance of the drop. The patient tells us not infrequently that the drop is as clear as water and is squeezed out in the morning, but agglutinates the meatus during the day. We then have to deal with a simple urorrhœa. It is a well-known fact that in erections, especially if protracted and vigorous, a drop of clear, stringy, sticky mucus escapes from the orifice (urorrhœa ex libidine of Fuerbringer, "suintement muceux" of Diday). This hypersecretion of a normal urethral mucus becomes permanent in individuals whose urethra is in an irritated condition from a previous blenorrhœa, habitual onanism or long-continued sexual excesses. This mucus contains very scanty formed elements, mucous corpuscles and epithelium, no pus cells, not infrequently a small number of various cocci and bacteria, but no gonococci.

Caution is necessary even if the mucus is colored and milky. The urorrhœa just described, especially if it follows an acute urethritis which has run its course, not infrequently makes the patient and physician believe in the continuance of the urethritis, and the necessity of treatment with injections, bougies, etc. The following state of affairs is then apt to develop:

The originally clear secretion becomes grayish, opalescent, then milky white. The cellular elements have increased in number, but consist only of epithelium, usually large rhombic pavement epithelium, upon and between which are numerous micro-organisms, especially a short, narrow bacillus, arranged in chains (Plate IV., Fig. 11). Their number is so large that I interpret the abundant desquamation of the epithelium covered by them as an irritative phenomenon, and incline to the opinion that the micro organisms enter the urethra during the injections and instrumental measures adopted against the urorrhœa, or that they enter from the præputial sac. They proliferate upon the soil which has been alkalinized and so prepared by the urorrhœa, and then give rise to the increased desquamation as a slight irritative phenomenon.

This form of urorrhœa heals rapidly after a few injections of a weak solution of corrosive sublimate (1:4000).

The same form may also occur in connection with chronic urethritis.

The prostatorrhœa described by us occurs, although rarely, either after a cured acute posterior urethritis, especially if it was complicated by epididymitis, or in masturbators; it occurs alone or combined with sexual neurasthenia. Its demonstration, therefore, is not an absolute sign of chronic posterior urethritis. The prostatorrhœa, which is usually manifested only

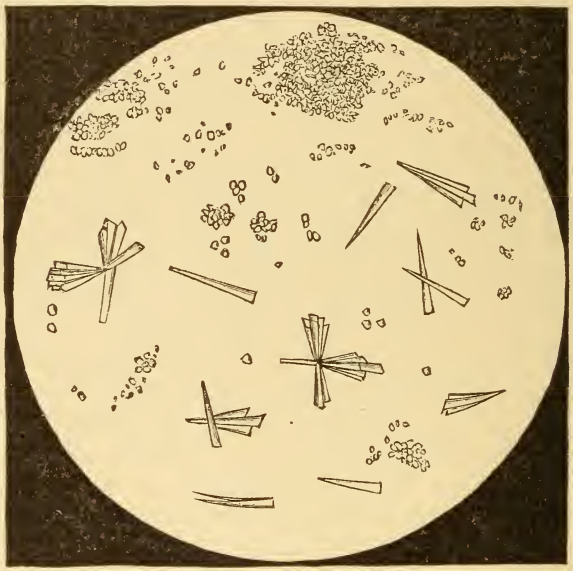


Fig. 26.

during defecation, must be associated with the symptoms of chronic urethritis, especially clap shreds containing pus corpuscles.

Finally, there is a rare form of prostatorrhœa which consists of increased production and discharge of normal prostatic secretion. Unlike the thick, muco-purulent secretion of prostatorrhœa due to chronic prostatitis, this is thin and milky, and is brought to light by pressure on the prostate per anum or by examination of the urethra with sounds of the highest possible calibre.

We have to consider one phenomenon, *viz.*, phosphaturia,

ignorance of which is apt to cause great confusion. We not infrequently observe the following condition in patients under treatment for chronic urethritis. At one time or another when the patient evacuates his urine in two portions, we find the entire urine of a milky white color, with a shade of green. If the urine is allowed to stand, a white granular or finely flocculent sediment is rapidly precipitated. This sediment not infrequently leads to the diagnosis of vesical catarrh. On examination with the microscope (Fig. 26) it is found to consist of phosphate and carbonate of lime, the former in amorphous, finely granular masses, the latter in wedge-shaped crystals, which are joined together into masses of sheaves and rosette shapes. The urine is feebly acid, neutral or feebly alkaline, thus increasing the suspicion of cystitis. But the diagnosis becomes clear, even without microscopic examination, on adding a few drops of acetic acid to the turbid urine, which clears it up. If carbonate of lime is present bubbles of carbonic acid form, but the phosphate of lime is dissolved without effervescence. This condition is explained by the insufficient acidity of the urine, which does not keep the constituents mentioned in solution.

Phosphaturia is observed under the following conditions: 1. In acute and chronic urethritis, when the patient keeps too strict a diet and abstains for a long time from acid or salted food. 2. In chronic urethritis posterior and neurasthenia, belonging with polyuria to the symptomatology of neurasthenia as a secretory neurosis. 3. In acute and chronic urethritis when the physician recommends alkaline mineral waters, especially Giesshuebler and Preblauer water, in addition to strict diet, as is unfortunately often done.

Phosphaturia not infrequently runs an entirely latent course; in other cases, especially when phosphate of lime predominates in the sediment, the crystals cause burning during micturition and vesical tenesmus.

The condition is usually not permanent; cloudy urine alternates with clear urine. The morning urine is usually clear, the first urine passed several hours after meals is cloudy.

Ingestion of vegetable acids, also hydrochloric, acetic, or phosphoric acid, generally causes rapid disappearance of the cloudiness. Cantani recommends:

℞ Acid. lactic., ... ʒ j.
Aq. fontis, ... ℥ vj.
Aq. menthæ, ... ʒ ij.
S. ℥ j in ½ glass of soda water every two hours.

The cloudiness of phosphaturia does not interfere with the diagnosis of chronic blenorrhœa, because the opacity due to the presence of the lime salts disappears on the addition of a few drops of acetic acid. The urine either becomes perfectly clear and shows the shreds of chronic urethritis, or a mucous cloudiness, in the more recent cases, remains, in which the shreds float.

Prognosis.

A cautious prognosis is even more necessary in chronic than in acute urethritis.

The length of time in which the blenorrhœa will recover can never be foretold, nor can we even tell with certainty whether the disease will be cured at all. With the more rational basis for therapeutics the possibility of cure becomes greater, and the physician who is versed in the advances of recent therapeutics will cure a larger number of cases than one whose entire repertory consists of a clap syringe and thirty or forty prescriptions for endlessly varying injections.

But a certain proportion of chronic blenorrhœas remain intractable to all treatment. In the first place, because many patients do not regard the question seriously enough and because they are lacking in a quality which cannot be supplied by the apothecary, *viz.*, patience. Others are incurable be cause they are treated too much, are really maltreated.

There are two factors which impair the prognosis of chronic blenorrhœa. One series of cases do not become agrgavated, even though they may not be cured, but another series grow worse with the lapse of years, and present complications and changes which become more distinct with the duration of the disease—stricture in anterior chronic urethritis, prostatorrhœa and sexual neurasthenia in posterior urethritis.

In general the prognosis is more favorable in recent cases, less favorable in old, inveterate cases. It is more favorable in anterior than in posterior urethritis, because the former is

more accessible to treatment, and stricture is a more easily treated complication than neurasthenia. The prognosis is also more favorable in those cases which have resulted from neglect of acute urethritis, more unfavorable in those in which the acute blenorrhœa had received various modes of treatment, and most unfavorable when the chronic urethritis itself has been the subject of varied, but usually unsystematic, therapeutic trials.

Finally, the prognosis is relatively favorable in those cases which, despite their long continuance, present neither stricture nor neurasthenic symptoms.

Treatment.

The same confusion is found here as in the treatment of acute urethritis.

The older physicians believed in the syphilitic character of chronic urethritis even more firmly than in that of the acute form, and the former was therefore treated with anti-syphilitic remedies if it did not yield within a certain length of time to copaiba, ptisans, and baths. We read in Fabre (1773): "Après tous ces remèdes, on saura à quoi s'en ténir sur le caractère de la maladie, et s'il faut en venir au grand remède pour la guérir, supposé qu'elle ne le soit pas."

On the whole chronic urethritis was neglected more often than at present, and only one sequel, *viz.*, stricture, received early treatment. Alexander Trajanus Petronius, of Castile, recommended cleansing the urethra with a wax candle or some similar instrument. The use of caustics in powder and ointments was also recommended, under the supposition that the stricture resulted from a caruncle or projecting spongy growth. Wiseman, physician to Charles II., inserted a tube into the urethra as far as the stricture, and there applied a caustic, viz., red precipitate. Caustics were used so vigorously at that time that Astruc (1754) made a decided protest, and mechanical dilating apparatus was employed thereafter. Le Dran recommended catgut, Daran bougies, which were used by Fabre (1773), Kuehn (1785) and Hunter (1786). B. Bell pointed out the circumscribed site of chronic blenorrhœa and recommended bougies, which must be thick, because they act, in the main, mechanically by exerting pressure. Local as-

tringents were also used. In obstinate cases Bell recommended that the bougies be smeared with turpentine or red precipitate ointment. Lallemand devised his porte-caustique in order to make localized cauterizations in the urethra and Mercier constructed a similar instrument. Both are short, curved catheters with a lateral fenestra, behind which is the caustic, which is at first concealed but is exposed by a twist.

Schuster (1870) recommended bougies of tannin and glycerine, which are introduced into the urethra, where they melt and act as astringents. Regnal and Lorey recommended gelatine bougies containing various solutions. Chiene (1876) injected into the urethra a paste of kaolin, oil and water. Walicki (1876) described an apparatus like a glove stretcher which is introduced, while closed, into the urethra, then opened, and used for blowing in powders. Zeissl made rods of kaolin and glycerine, which he inserted into the canal. Masurel injected a saturated solution of tincture of iodine in water. In obstinate cases of chronic urethritis Harrison (1885) even went so far as to draw off the urine by incising the membranous portion, and passing a silver cannula into the bladder.

All the injections to which we have referred in discussing acute urethritis have also been given in the chronic form, as well as the most varied internal remedies.

The local remedies and methods mentioned have all been recommended on a purely empirical basis, without any indication or accurate notion of their action. As they are introduced blindly into the urethra or after a preliminary exploration with the sound, it is never certain that they come in contact with the diseased surface. But they always reach healthy portions of the urethra and cause irritation. The action of the inert materials, such as kaolin, is purely mechanical and irritating, and even the astringents possess merely a superficial effect.

Desormeaux had obtained some therapeutic benefits in cases in which he found a circumscribed lesion in the urethra, by fixing the endoscope in the canal, removing the illuminating apparatus, and applying medicaments through the tube. Or he inserted a lateral opening in the endoscopic tube for the introduction of a tampon, brush, and caustic-holder, and thus manipulated under the control of the eye. Tarnowsky also practiced treatment through the endoscope, and warmly rec-

ommends it. As the endoscope was improved, local manipulations were facilitated. Gruenfeld, Gschirhakl and Auspitz adopted endoscopic treatment, and Gruenfeld regarded it as the only rational method. But this is not true. Apart from the fact that the introduction of the instrument irritates the mucous membrane, and is apt to produce catarrhal symptoms on frequent application, all the manipulations performed in the endoscope, cauterizations as well as brushings, are directed only to the surface of the mucous membrane, and cannot affect infiltrations which are situated deep in the mucosa and in the submucous tissue. Just as in the treatment of trachoma the brushing with solutions of nitrate of silver and cauterization with copper sulphate in substance may cause disappearance of the granulations, but cannot prevent the formation of cicatrices, so the same manipulations in the endoscope may heal erosions and granulations, while deep infiltrations which may be present will run their progressive course and terminate in stricture.

Hence we also require methods which have a deeper action. B. Bell had recognized that the use of bougies depends chiefly on their pressure effects. But Otis was the first who, with the proper appreciation of the varying diameters of the different parts of the urethra, employed pressure in its full measure. He taught us how to measure the diameter of the normal urethra by means of the urethrometer, an instrument which also informs us concerning those beginning stenoses whose calibre is still greater than that of the meatus. Previous to Otis we were satisfied with passing those sounds which would just pass through the orifice. It is clear, however, that such a sound, for example, No. 24 Charrière, could show nothing if a part of the bulb is narrowed from 45 Charrière to 36, and therapeutic action would also be imperfect. It is clear that a portion of the canal which originally had a calibre No. 40, could only be regarded as normal when it is again stretched to No. 40. This dilatation was hitherto prevented by the narrowness of the orifice. To the circumstance that strictures ceased to be treated when they reached the width of the external meatus is due the fact that the majority are merely improved, not cured, and that they relapse so rapidly.

Otis formulated the correct principle that the canal must be restored to its original calibre, and therefore employed

sounds of large size, up to 30 or more. The resistance of the meatus to such a sound is removed by splitting it in the direction towards the frenulum. The little operation is a trivial one and heals rapidly. By successive increase of the size of the sounds, Otis heals beginning strictures as heretofore, except that he brings the canal to its normal dimensions or even beyond.

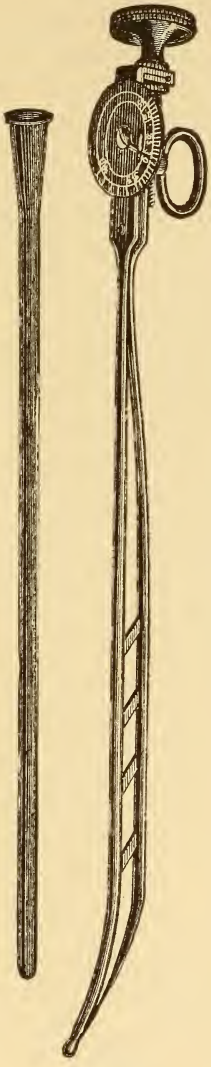


Fig. 27.

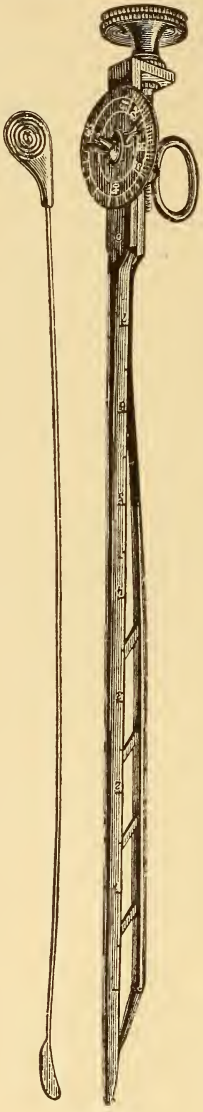


Fig. 28.

Oberlaender (1887) and v. Planner were not satisfied with this gradual dilatation, but independently devised dilators. These possess straight or slightly curved blades of steel, which can be separated uniformly by the action of a screw, and an index shows the degree of dilatation. A lining of rubber prevents nipping of the folds of the mucous membrane. The object of these dilators is not alone to act by pressure but also to tear the chronic infiltration by the forced dilatation. Oberlaender imagines that from these rents an acute inflammation will start and will aid in the absorption of the chronic infiltration.

Otis (1880) devised a dilating urethrotome (Fig. 28) which

closely resembles Oberlaender's, except that the upper blade carries a concealed knife, which is exposed by means of a spring. Forced dilatation is thus united with internal urethrotomy when the resisting tissue will not yield.

Starting from the theoretically correct and certainly practicable idea of the union of pressure and astringents, *i.e.*, of deep and superficial action, Unna (1884) devised his ointment sounds. He covers his sounds with a mixture of:

℞ Ol. cacao,	ʒ iij.
Ceræ flavæ,	ʒ ss.
Argent. nitrat.,	gr. xv.
Bals. peruvian.,	ʒ ss.

℞ Paraffini,	ʒ iij.
Bals. copaiv.,	gr. xxx.
Argent. nitrat.,	gr. xv.
Vaselin.,	s. ad ʒ iij.

℞ Gelatin alb.,	ʒ i.
Aq. destil.,	ʒ iij.
Glycerin.,	ʒ ss.
Vaselin.,	ʒ v.
Argent. nitrat.,	gr. xv.

This mass, which is solid at ordinary temperatures, is liquefied in a lukewarm water bath, the sounds dipped in it and then hung up at the temperature of the room.

The warmth of the urethra melts the mass, and the nitrate of silver contained in it then acts upon the mucous membrane. Instead of the ordinary cylindrical sounds Casper uses sounds with six grooves, which terminate 5 cm. from the tip, and are intended for the reception of the ointment. In this way he avoids the passage of the ointment into the bladder. Appel and v. Planner, although they advocate this plan, observed irritative symptoms on the part of the urethra and bladder. Despite the good results obtained in many cases by this mode of treatment, I oppose it for the reason that the entire urethral mucous membrane is brought in contact with a strongly irritating 1 per cent. nitrate of silver ointment, and hence the healthy mucous membrane is irritated and hypersecretion induced.

I will now analyze those methods which I can recommend as the most useful, within the bounds of certain indications.

Apart from the localization we have recognized two forms of chronic urethritis:

1. The more recent forms in which, in addition to circumscribed foci, larger surfaces of the mucous membrane appear to suffer from congestion or passive hyperæmia. They manifest themselves by increased production of mucus, *i.e.*, by a cloudy, mucous urine associated with clap shreds.

2. Circumscribed, older forms, in which the changes, *a*, are either superficial, in the mucosa,

Or, *b*, are also situated in the submucous tissue. In accordance with this classification I will formulate a few sharply defined indications.

I. In the first form we must first combat the concomitant catarrhal symptoms, by applying dilute, feeble astringent solutions to the catarrhal portions, so that only the deeper foci remain.

II. In variety *a* of the second form we must cure the circumscribed foci in the mucosa by making local applications of stronger astringents and caustics.

In variety *b* of the second form we must act upon the submucosa by pressure and absorbents, in addition to the previously mentioned indications.

In all three cases, however, we must ascertain the localization in order to apply the remedies actually upon all diseased parts.

When to begin treatment is an important question. If we have to deal with a neglected chronic urethritis which has not been treated for a long time, we must begin at once.

Our plan must be entirely different if the patient, up to the time that he came under our care, has been treated for a long time by the various astringents, caustic and instrumental procedures.

In these cases I cannot advise too strongly against the continuance of the treatment. It is urgently necessary to permit a rest in local treatment. We must not forget that prolonged treatment, especially if carried out vigorously and with active remedies, is apt to cause irritation of healthy portions of the urethra, whose secretion aggravates the symptoms. If we wish to know the real condition, the irritative symp-

toms must be made to disappear by discontinuing the irritation.

I desist, therefore, for several weeks from all local treatment, and, in order that I may appear to be doing something, give internally a little sandal-wood oil, cubebs, or kawa-kawa. If the proper hygienic-dietetic rules have also been carried out, the irritative symptoms, which may have been present, will disappear, and in three or four weeks we have the uncomplicated condition before us.

Finally, it goes without saying that uncomplicated, chronic urethritis alone may be the subject of local treatment.

I. If we proceed according to these principles, and have to deal, as the symptoms prove (I do not recommend the sound and endoscope for the more recent forms of chronic urethritis), with a recent chronic urethritis of the pars anterior, we may inject diluted astringents with the gonorrhœa syringe. It is better, however, to inject under stronger pressure, with the aid of my apparatus. We prescribe:

℞ Argent. nitrat., ... gr. iss.
Aq. destil., ... ℥ iij.

℞ Cupri sulph., ... gr. iss.
Aq. destil., ... ℥ iij.

which is injected once a day in the evening. My favorite plan in these cases is to perform irrigation of the pars anterior every second day, while the patient himself uses the injections two to three times a day. After the patient has urinated I pass to the bulb with a not too large elastic catheter and inject one of the usual solutions from behind forwards through the entire pars anterior. During the injection I occasionally compress the external orifice and thus secure complete distention of the pars anterior and entrance of the drug into the folds and openings of the follicles. But the process is rarely confined to the pars anterior. The symptoms or the history of a previous epididymitis or acute posterior urethritis often indicates with certainty, or at least with great probability, that the catarrhal disease extends to the pars posterior. In such cases the entire urethra must be washed with the astringents. I prefer to do this according to Diday's method rather

than with Ultzmann's irrigation catheter, inasmuch as the metallic catheter always irritates more strongly, and I regard the unirritating application of the remedies as very important. With irrigations every second day—every third day if the reaction is marked—the mucous secretion disappears, and the urine contains only flocculi. We now have the second form of chronic urethritis before us. After the urine has cleared up, it is advisable to permit a short interval to elapse before proceeding to the treatment of the localized infiltration in the mucous membrane.

II. If the case is one of the older forms—clap shreds in the clear morning urine—we must localize both the situation as well as the depth of the affection, by the aid of the sound, urethrometer and endoscope.

We will first assume that we are dealing with a superficial

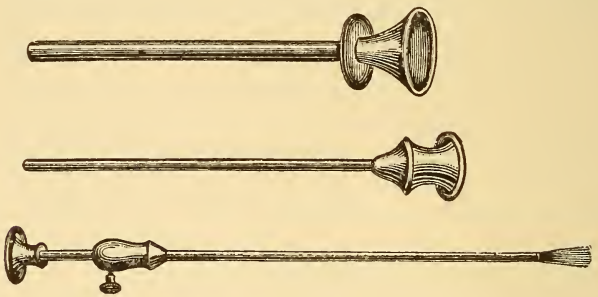


Fig. 29.

chronic urethritis, localized in the mucosa, without beginning stricture or implication of the prostate.

It is then our object to apply the more concentrated astringents upon the site of disease and upon this alone.

If the instrumental examination has shown that the disease is confined to the pars anterior the astringents may be applied most simply by the aid of Ultzmann's brush apparatus (Fig. 29). This consists of a narrow hard-rubber endoscope, usually Charrière 16 to 18, whose introduction, with a conductor, into the anterior urethra causes but little irritation. The astringent solution is applied through this endoscope by means of a brush whose handle can be moved in such a way that the hair of the brush alone projects beyond the rim of the endoscope. We may use nitrate of silver 1:30 to 50, or sulphate of copper, which I recommend particularly, in the same strength.

Cases of isolated foci in the pars bulbosa are rare. The

process extends more frequently into the membranous portion; often there is also a second focus in the prostatica portion, or the latter alone is demonstrable.

In these cases we may use gelatine suppositories prepared according to the following formula:

℞ Iodoform, ... gr. vij.
Tannin, ... gr. iij.
Zinc. sulph., ... gr. iij.
Cupri sulph., ... gr. iss.
Argent. nitrat., ... gr. ¾.
Gelatinæ albæ q. s. f. supposit. urethralia conica No. x. āā 2 inches x ⅕ inch.

These are oiled and introduced by the patient, in the recumbent posture, as far as he is able, with the fingers on the perineum, to follow the urethra. The patient then fixes the bougie by the pressure of the fingers, it melts and thus produces its effect. But this mode of application is uncertain. The liquefied mass sometimes escapes externally and irritates healthy portions of the mucous membrane.

Ultzmann recommends bougies of butter of cacao:

℞ Alumin. crudi, ... gr. xv.
Tannin. pulv., ... gr. v.–viij.
Zinci sulph., ... gr. ij.–v.
Argent. nitrat., ... gr. iss.
Butyr. cacao q. s. f. supposit. urethralia brevia No. V.

These are inserted into the pars prostatica by the aid of Dittel's "porte remède" (Fig. 30). This instrument consists of a catheter open at the vesical end, and whose opening is closed by an olive tip situated on a conducting rod, furnished with a spring. The catheter, closed by the olive tip, is passed into the urethra as far as the pars prostatica, the olive and conducting rod withdrawn, and one of the previously mentioned bougies inserted into the catheter. This is then shoved forwards by means of the tip and deposited in the pars prostatica.

In these cases I prefer to make local injections of a few drops of fluid by means of Guyon's syringe or Ultzmann's catheter syringe.

After the Pravaz syringe of Ultzmann's apparatus is filled a few drops are first deposited in the pars prostatica, and, if

necessary, a few drops may also be applied, during withdrawal, to the membranous portion. I use 0.1–10 per cent. solutions of silver and copper, beginning with the weaker ones and increasing the strength gradually as the irritation produced by them begins to diminish. The instrument should be lubricated with glycerine, because oil, when carried into the urethra, forms a layer which is permeable with difficulty by the watery solutions, and therefore weakens their action.

The introduction of lanolin ointments is more serviceable than that of watery solutions. Tommasoli (1887) has devised a simple syringe (Fig. 31) for their introduction, and many trials, some associated with him, have led me to recognize the advantages, of this method. The syringe consists of a short catheter, No. 16 to 18 Charrière, with a moderately large opening at the vesical end. Within the catheter is a piston on a somewhat flexible rod, which carries marks, that correspond to a decigramme. The ointment is placed in an ordinary clap syringe and then injected into the open catheter syringe from behind. The following formula is used:

℞ Argent. nitrat. or cupri sulph. or creolin., gr. xv.– ʒ i.
Lanolin, ... ℥ iij.
Ol. olivar., ... ʒ iss.

The filled and slightly lubricated syringe is now introduced into the pars prostatica and one decigramme deposited. During withdrawal, the ointment may also be deposited in the membranous portion and bulb.

The lanolin ointments possess the advantage of adhering intimately to the mucous membrane. If fluids, gelatine or cacao-butter bougies are introduced, they are washed out of the urethra by the first micturition. On the other hand, the contracting urethral walls compress the lanolin ointment after the injection and press it into the mucous membrane. Micturition evacuates only small particles of the ointment, which are found in the urine even thirty-six hours after injection. Even pollutions do not remove all the ointment from the urethra. It therefore forms a real urethral bandage, and its protracted action and gradual absorption have a more favorable effect than the ephemerally acting solutions. In addition, as Professor Liebreich kindly informs me, lanolin is an aseptic substance.

FIG. 30.

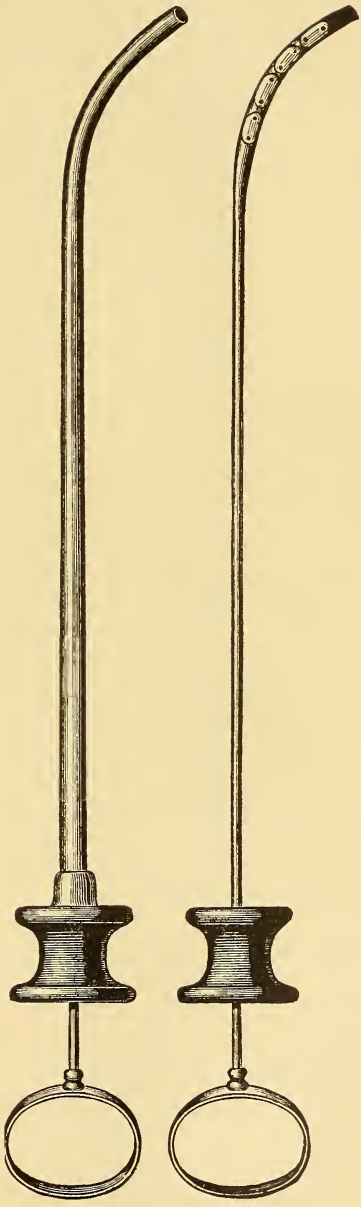


FIG. 31.

B. Finally, we must consider the last form of chronic urethritis, in which the process extends to the submucous tissues, and produces either diminished dilatability or hypertrophy of the caput gallinaginis with secondary prostatorrhœa and neurasthenia.

One of the most sovereign remedies is pressure. We here use sounds of large calibre, beginning with those which barely pass the stricture and gradually increasing to 28 or 30 Charrière, perhaps after preliminary incision of the external orifice. If the infiltration is very dense and extends to a considerable depth or is undergoing fibrillary changes—in which event the urethrometer shows considerable diminution of dilatability and the resistance to further separation of the instrument is marked—the treatment with sounds often proves insufficient.

In such cases we may resort to Oberlaender's dilator. The instrument, well lubricated with glycerin or vaselin, is first introduced as far as it can be without pain, and dilatation is performed without the employment of violence. At the end of a few minutes the dilatation is increased one or two numbers. Too rapid dilatation is inadvisable. When the infiltration yields blood will escape either during or after the dilatation. The dilatations are repeated at intervals of eight to ten days, the amount being increased at each sitting.

Otis' dilating urethratome is only indicated when the dilatation is resisted by very firm connective tissue.

When this form is located in the pars prostatica and the caput gallinaginis is hypertrophied, no stricture can be demonstrated, nevertheless the use of large sounds is often attended with admirable results. In wide strictures the mucous membrane of their surface and surrounding parts is usually the site of chronic inflammation. In addition to sounds we may, accordingly, also use astringents in the previously mentioned manner, applying either aqueous solutions or lanolin ointments to the diseased parts. We particularly recommend the following:

℞ Potass. iodid., ... ʒ iss.
Iodin. puri,. . . . . gr. xv.
Lanolin, ... ℥ iij.
Ol. oilvar., ... ʒ iss.
M. Exactissime.

This ointment is absorbed well and has often stood me in good stead in old foci in the bulb as well as in the caput gallinaginis. In these cases we first introduce the oiled sound, keep it *in situ* for five to fifteen minutes, and then, by means of Tommasoli's syringe, deposit the above ointment in the pars prostatica, and, if necessary, in the membranous portion. In performing Oberlaender's dilatation the injections are used one to three days after the dilatation.

Winternitz's psychrophor, the cooling sound (Fig. 32), is admirably adapted for cases of isolated disease of the pars posterior with hypertrophy of the caput gallinaginis, prostatorrhœa, and micturition and defecation spermatorrhœa. The instrument consists of a completely closed catheter, of 20 to 24 calibre, which is divided internally into two compartments by a longitudinal septum. These communicate anteriorly at the tip of the catheter and are connected externally, at the fork-shaped end, with two tubes. If one of these tubes is dipped into an elevated vessel of water and suction made upon the other, the water will run through the catheter (to which it communicates its temperature) and flow into a lower vessel by a syphon action. The catheter is inserted as far as the pars prostatica—its introduction into the bladder may give rise to irritative symptoms—and water

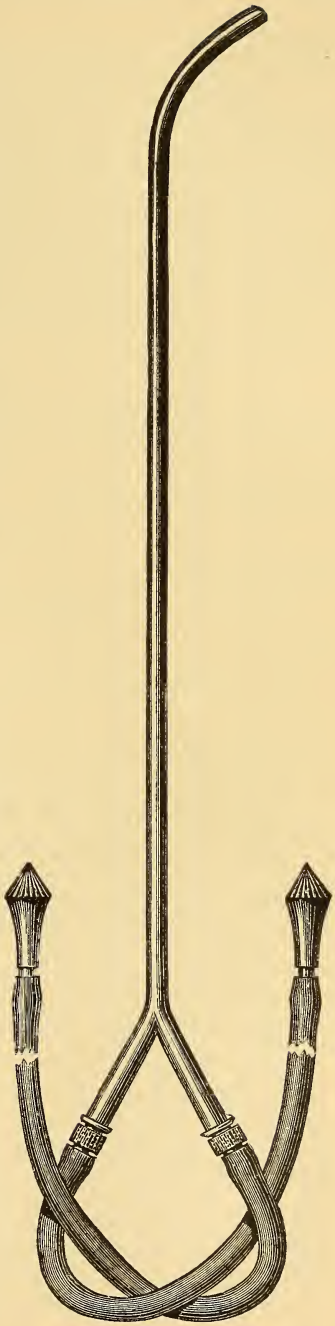


Fig. 32.

is allowed to flow through for about fifteen minutes daily, at first at the temperature of the room, but gradually cooled, in subsequent applications, to 10° C. This may be followed by the injection of a few drops of a strong solution (3 to 5 per cent.) of nitrate of silver, or of a nitrate of silver or iodine-lanoline ointment into the pars prostatica.

If the patient has been examined with the endoscope and tolerates this manipulation well, the results of treatment may be controlled in this way every two to four weeks, and, at the same time, the locus morbi cauterized with sulphate of copper or the solid stick.

The relatively rare polypi, which can only be diagnosed with the endoscope and whose connection with chronic urethritis is questionable, require surgical treatment with forceps, with snares and scissors. The operation may be performed through the endoscope.

And now a few general recommendations concerning all these procedures.

With the exception of Diday's irrigation, which is performed when the bladder is moderately full, all these manipulations should be preceded by evacuation of the bladder.

All local measures are followed by a reaction, greater after injections, slighter after the applications of sounds. When the manipulation is confined to the pars anterior the reaction is manifested by suppuration; when the pars posterior is also implicated, by vesical tenesmus.

These symptoms follow the manipulation forthwith, and rapidly reach their acme, after which they soon subside. The reaction is usually ended in six to twelve hours. The tenesmus, which is often distressing after the injection, soon forces the patient to urinate. This is relieved by the preliminary introduction of a morphine or belladonna suppository. It is well to direct the patient not to urinate for several hours after the injection or sounding.

The repetition of the manipulation, application of the sounds, irrigation, or injection, is made every three or four days. It should never be performed earlier than twenty-four hours after the cessation of the reaction occasioned by the previous manipulation. It is also advisable not to treat continuously for too long a time, but to desist for one to two weeks after a period of several weeks' treatment.

The urethra becomes dulled against all irritants and their

action becomes more distinct after a rest. In many cases sounding for beginning stricture is no exception to this rule, but we may often carry on the treatment continuously.

The treatment is to be kept up until complete recovery, *i.e.*, until all morbid symptoms have disappeared. But it should not be forgotten that clap shreds consisting of epithelium and desquamations from xerotic patches are trifling matters and not to be relieved, and that long protracted treatment itself may cause hypersecretion and proliferation of the mucous membrane, *i.e.*, cloudiness of and flocculi in the urine. In other words the effects of the remedies only appear distinctly after the cessation of treatment.

We should always secure regular evacuations from the bowels. Constipation and hemorrhoidal difficulties cause delay in recovery and exacerbations.

Frequent lukewarm sitz baths, full baths and sea-bathing act as adjuvants.

The strict injunctions regarding food and drink which are given in acute urethritis are unnecessary; the patient must simply avoid indigestible, constipating food and an excess of alcoholics.

Moderate exercise is permissible; forced movements, especially riding, are to be eschewed.

The question of coitus is important. When performed with a preventative, infection of the partner is not easily possible. To forbid coitus in chronic gonorrhœa is impracticable, because the patient will not obey instructions. I therefore consider it advisable not to destroy the patient's candor, but to remain *en rapport* with him on this point. Coitus may be allowed at intervals of three to four weeks, but his attention may be called to the fact that a coincidence of the irritation of treatment with that of coitus will produce a more intense reaction by summation of the irritation, and that an interval of at least forty-eight hours should elapse between local interference and coitus.

It is evident that we must also consider the general nutritive condition, and that any disturbances, which not infrequently react on the blenorrhœa, must be treated. The neurasthenic symptoms associated with chronic posterior urethritis, so long as they remain localized, recover not infrequently as soon as the urethritis is cured. In other cases, especially if they are more diffuse and spinal in character, they require special treatment after recovery of the urethritis.

CHAPTER IV.

COMPLICATIONS OF BLENORRHŒA IN THE MALE.

General Remarks.

In a large number of cases gonorrhœa runs its course in the manner described above. In others, however, the process not alone has a tendency to spread along the surface of the mucous membrane, but also to extend to other tissues or organs.

This extension occurs in two ways. Thus, the process may simply spread deeply, through the mucosa to the submucous tissue and other subjacent tissues, such as the corpus cavernosum.

Or the process extends along the surface. This surface is not continuous, but is interrupted by a large number of excretory ducts of annexed glandular organs. Passing to these mucous membranes which are in direct continuity with the urethra, the inflammatory process extends to the glandular bodies themselves, in which it also sets up inflammation, such as folliculitis, cowperitis, prostatitis, vesiculitis, epididymitis.

The bladder is also affected by direct spread of the disease, which may extend, in rare cases, through the ureters to the pelves of the kidneys and the kidneys.

Finally, there is a third series of complications, which are common to both sexes, but in which the manner in which the morbid irritation is conveyed is unknown. These will be discussed separately at the close. They include the more remote complications, such as rheumatism, iritis and endocarditis.

The first two groups of complications, which are conveyed directly per continuitatem or per contiguitatem, usually accompany acute inflammation. Some also complicate chronic blenorrhœa, *viz.*, prostatis, vesiculitis, cystitis.

Certain complications, cavernitis, cowperitis, occur in ante-

rior urethritis; others, such as prostatitis, vesiculitis, epididymitis, cystitis, only follow posterior urethritis.

We may therefore distinguish direct complications, resulting from propagation of the process, and remote, metastatic complications. The former are subdivided into those which have developed per continuitatem and per contiguitatem.

Finally, we must distinguish complications of acute and chronic urethritis, and those of anterior and posterior urethritis.

The most important question concerns the mode of origin of these complicating inflammations: Are they also due to the gonococcus?

This question has been recently answered in a manner which is diametrically opposed to our previous notions.

Until recently there was no opposition to Bumm's opinion that the gonococcus only enters mucous membranes which possess cylindrical epithelium, that it cannot vegetate upon and in pavement epithelium, and that it only produces superficial inflammations because it proliferates solely in the epithelium and the uppermost layers of the subepithelial connective tissue.

Recent investigations have led to a decided change in these opinions.

In the first place, Toulon (1889), Jadassohn (1890), Fabry (1891), and Pick (1891), have shown that gonococci may also grow upon the pavement epithelium of the para-urethral and præputial canals, which belong to the epidermal type. Furthermore, Wertheim (1892) proved that the gonococcus may also penetrate deep into the connective tissue, and produce inflammation and suppuration.

Investigations have shown, however, that the character of the epithelium plays a certain part in the immigration of the coccus.

1. The epithelium of the para-urethral ducts, an epidermis-like pavement epithelium, appears to offer the greatest resistance to the gonococcus. Here it vegetates only upon the two or three upper layers of epithelium.

2. The buccal mucous membrane, which has several layers of pavement epithelium, offers less resistance to the gonococcus. According to Rosinski's investigations on the gonorrhœal aphthæ of the new-born, it penetrates the epithelial cells, pushes along the interepithelial spaces, and is only prevented from en-

tering the connective tissue by a firm tunica propria. In both these cases, however, the epithelium appears to prevent the entrance of the coccus into the connective tissue.

3. The conjunctiva and rectum, which possess several layers of cylindrical epithelium, appear to be penetrated rapidly by the gonococcus. According to Bumm's investigations, at all events, it rapidly passes in the conjunctiva to the upper layer of the subepithelial connective tissue. In the rectum, according to Frisch (1891), it passes through the subepithelial connective tissue to the muscular coat.

4. Fallopian tube. This mucous membrane has a single layer of ciliated cylindrical epithelium. According to Wertheim (1892), its entire thickness may be infiltrated with gonococci, as far as the outer peritoneal coat.

5. Peritoneum. This is covered with a single layer of pavement epithelium. According to Wertheim's experiments on animals, the gonococci may penetrate freely into the connective tissue at the end of twenty-four hours.

The gonococcus may also proliferate freely in connective tissue and may excite intense inflammation. Thus Pellizzarri (1890) and Christiani (1891) have found the gonococcus in periurethral abscesses as the sole micro-organism.

In two cases of inflammatory œdema of the prepuce, complicating a recent urethritis, Crippa (1893) found gonococci in the œdema fluid. Wertheim observed them as the causes of ovarian abscesses.

At the present time, accordingly, it cannot be denied that all the complications of blenorrhœa, which develop per continuitatem, in both sexes, may be due to the gonococcus alone.

It would be a mistake, however, to attribute all these complications unreservedly to this micro-organism. Several possibilities should be borne in mind.

In the first place, Lustgarten, Mannaberg, and Tommasoli have shown that the normal urethra and the præputial sac contain pus cocci. Hence there is a possibility of mixed infection, of the penetration of pus cocci into the mucous membrane which has been attacked by the gonococci.

Furthermore, the staphylococcus pyogenes aureus has been found in gonorrhœal pus and therefore upon the diseased mucous membrane.

Finally, it should not be forgotten that the presence of pus

cocci in certain complications of acute urethritis has been directly demonstrated. Thus Bockhart found them in peri-urethral abscesses, and Bumm, Saenger, and Gersheim also found them, in addition to the gonococcus, in abscesses of Bartholini's glands.

Wille found gonococci and streptococcus pyogenes aureus, in two cases, in the pus of pyosalpinx, while Bumm, Loven, Penrose, and Menge found only pus cocci in seven cases of pyosalpinx which were undoubtedly due to gonorrhœa.

Hence it cannot be denied that a complication of urethritis may also be produced by pus cocci. The mode of development of the complications is therefore threefold.

(*a*) The complication is due solely to the gonococcus, is purely gonorrhœal in character.

(*b*) The disease of the mucous membrane is merely the point of entrance for other pus cocci which produce the complication (mixed infection).

(*c*) Or the gonococcus produces a complication, and pus cocci subsequently enter. These may co-exist for some time, then the gonococcus is destroyed and the pus coccus alone remains (secondary infection).

Another series of complications, such as glandular disease, rheumatism, heart disease, cutaneous abscesses (Lang, 1893), develop metastatically.

These complications may also develop in various ways.

(*a*) The metastatic complication is due to the gonococcus, is purely gonorrhœal. The coccus may be transported through the lymph channels (lymphatic glands) or the blood-vessels (joints, heart, skin). Hamonic, Le Roy, Tedenat, and Jullien claim to have found the gonococcus in the blood, but this is denied by Trapesnikow.

(*b*) The complication is due to mixed infection or secondary infection, and pus cocci are then found as the morbific agents.

(*c*) The morbid foci contain neither gonococci nor pus cocci. The metastasis is then regarded as a ptomaine intoxication, whether correctly or not cannot be decided at the present time.

I. BALANITIS.

Etiology.

Balanitis is a catarrhal inflammation of the surface of the glans and the inner layer of the prepuce. This is a complica-

tion of blenorrhœa in a remote sense alone, inasmuch as it develops at the same time, but does not always depend genetically upon it. The development of balanitis is a double one in these cases. It not infrequently even precedes the urethritis. The superficial catarrhal inflammation is produced by local irritants of the most varied kinds—for example, by uncleanliness of all kinds, if deposited in the preputial sac and not removed early enough. Now, we notice that not infrequently balanitis develops soon after coitus, usually within twenty-four hours, while the clap does not begin until the fourth or fifth day. In such cases, as a matter of course, the balanitis is not caused by clap, but both have the same source, *viz.*, impure coitus with a blenorrhagic female. But while the clap is due to the specific virus, simple balanitis is the result of the irritant action of the blenorrhagic or otherwise contaminated vaginal secretion.

In other cases the balanitis develops during the course of gonorrhœa. The gonorrhœal pus itself then takes the part of irritant; it flows into the preputial sac, and if not removed with sufficient frequency, gives rise to inflammation. But the *rôle* of the gonorrhœal secretion is then merely an irritating, non-specific one. Balanitis may result from various other causes, such as the irritation of glycosuric decomposing urine in diabetics. The secretion of balanitis contains the most varied forms of cocci and bacteria, also gonococci, if it has been mingled with gonorrhœal pus, but none of these micro-organisms occurs in such proportions that we may claim for it a part in the production of balanitis.

Balanitis has also been looked upon as the consequence of an excessive amount of normal smegma, but this is erroneous. In hospital and dispensary practice we not infrequently see individuals who pay very little attention to the preputial sac, and in which the smegma collects for a long time in such quantities that it finally forms incrustations or preputial calculi. Nevertheless balanitis does not develop in such cases. On the other hand we find scrupulously clean individuals who can detect the beginning of balanitis if they omit cleaning the preputial sac for a single day. If we examine the smegma in such patients, it will be found to be a thin fluid, and it is this which proves especially irritating. Whether this condition of the smegma depends on morbid production or on decomposi-

tion immediately after its formation, on account of local influences, we must leave undecided.

When the irritation of blenorrhagic secretion produces balanitis, a long tight prepuce is a favoring factor, because it interferes with the discharge of the gonorrhœal pus externally and retains it in the preputial sac.

Symptomatology.

The symptoms of balanitis are usually so simple and clear as to admit of no doubt. On examination of the penis externally, we usually find no change, but sometimes the preputial sac appears distended, especially in the region of the corona glandis. In unclean patients we will be struck by the amount of pus which soils the clothes, an amount greater than that produced in acute blenorrhœa in some time. Crusts of dried pus are usually found at the edge of the prepuce. If the prepuce is drawn back and the glans exposed, an abundance of thin, foul-smelling pus escapes, and, after its removal, the inner layer of the prepuce is found to be slightly swollen, reddened, and loosened. The surface of the inner layer is often velvety, even presents small, mulberry-like nodules, is destitute of epithelium, and bleeds easily on contact. These appearances increase from without inwards and are most intense in the coronary sulcus. They are less marked on the glans. In the severest cases the entire surface of the glans is reddened, eroded and secreting. In milder cases we find only superficial eroded patches, or the corona is the site of an extensive erosion, which diminishes towards the glans, the latter presenting only one or a few small erosions. A somewhat annoying itching and pricking in the coronary sulcus, associated at the most with slightly increased sexual excitability, are the sole symptoms of this condition.

In other cases the inflammation is more severe, the entire prepuce is involved and appears slightly œdematous, thus interfering with its retraction. The secretion is more abundant. We then find upon the glans a series of sharply defined, red patches, deprived of epithelium, with jagged, map-like contours. They usually coalesce towards the corona glandis. Pain is generally present in these cases, especially on contact, and is annoying to the patient in walking or on friction of the

underclothing against the penis. Erections are accompanied by violent pains, resulting from the stretching of the prepuce by the erect glans.

If the inflammation is more severe, the lymphatics which originate in the coronary sulcus are involved. We then find doughy, very sensitive nodular infiltrations which start from the sulcus and are situated beneath its covering and the skin of the penis. On complete retraction of the prepuce they project like a hemisphere beneath its inner lamella. These infiltrations are either circumscribed or they are connected by narrow bands with the lymphatic plexus of the dorsum penis, which is then swollen and painful.

If the inflammatory symptoms progress the œdema of the prepuce also increases. The entire penis then assumes the shape of a club, which is larger towards the glans. In these cases reposition of the prepuce is no longer possible (phimosis). If the inflammatory swelling and œdema increase still more, the mutual pressure of the glans and prepuce may give rise to circulatory disturbances, or even partial cessation of circulation, which then results in gangrene. As the gangrene is always moist, an ichorous, instead of a purulent, secretion takes place from the preputial sac. The prepuce then has a dark red, livid red or even blue color, and if it is incised, as is absolutely indicated in such cases, the inner layer of the prepuce, more rarely a portion of the corona glandis, is found converted into a putrid, spongy, ichorous mass. If left to itself the gangrene of the inner layer usually penetrates, at some point, through the entire prepuce, especially on the dorsum. An opening is thus formed in the prepuce, through which the glans forces its way. This relieves the circulatory disturbance, the gangrenous portions are exfoliated, and recovery occurs by means of granulations and cicatrization. The rest of the prepuce shrivels, and hangs from the bare glans as an apron-like appendix. The general condition usually suffers, fever and even indications of stupor set in, but, on the other hand, there may be complete apyrexia without constitutional symptoms.

In the milder cases—with moderate œdema and without gangrene—complete absorption usually follows. But in some the absorption is incomplete, and slight thickening of the integument of the prepuce remains. If these attacks of balanitis with œdema recur, and the absorption remains incomplete,

rigidity and thickening of the prepuce finally result, and its reposition is interfered with or made impossible. Such a rigid, elephantiatic prepuce is apt to be fissured during coitus, especially at the margin, and thus predisposes to infection. The fissures, which are easily inflamed, soiled by urine, and heal with difficulty, give rise, if frequently repeated, to constantly increasing sclerosis and narrowing of the opening.

If erosions on the glans and inner layer of the prepuce are in apposition during a balanitis, and remain in contact for a long time on account of phimosis, they may finally result in partial adhesions. Even complete adhesions may form over a larger or smaller surface, starting from the coronary sulcus and extending over the corona to the middle of the glans, etc. The line at which the adhesion ceases, becoming eroded by a fresh balanitis, gives rise to extension of the adhesion, which may advance finally to the orifice of the urethra.

As a matter of course, balanitis cannot develop when the preputial sac is absent, as in circumcised individuals. But ritual circumcisions are often performed roughly with the aid of sharp finger nails, instead of the knife, and the glans is thus injured. The remains of the prepuce may then adhere to these injured spots, and span the coronary sulcus like a bridge. In the cavities which are formed in this way a catarrhal inflammation, which is entirely analogous to balanitis, may develop, and if neglected, may give rise to swelling of the bridge-shaped remains of the prepuce, to pain and often to quite violent inflammatory symptoms.

Mannino (1889) mentions several other complications of balanoposthitis. 1. Multiple indurated glandular swellings in lymphatic individuals. 2. Ulcers which resemble soft chancre. They are usually multiple and furnish typical pustules on inoculation, but they differ from soft chancre only by their spontaneous development upon the basis of a balanitis. They furnish a pregnant illustration of my opinion that soft chancre is not a specific virulent affection, but is the product of the inoculation of pus or the different pus producers. This is explained by Tommasoli's finding of pus cocci (streptococcus and staphylococcus) in the normal præputial secretion and in that of balanitis. If an individual whose præputial secretion normally contains pus cocci suffers from balanitis, the pus cocci which enter the erosions of balanitis will produce suppu-

ration, *i.e.*, soft chancre. 3. These "soft chancres," especially when situated in the coronary sulcus, may have a firm base and simulate induration. My anatomical investigations have explained the development of this induration. Inoculation of these firm ulcers produces the characteristic inoculation pustule.

Diagnosis and Differential Diagnosis.

The diagnosis is evident from the above-mentioned symptoms, and we might imagine that there can be no doubt in cases in which retraction of the prepuce is possible. Nevertheless, mistakes are often made in such cases, and urethritis and balanitis are often confounded. In cases of abundant purulent secretion from the urethra, when the prepuce is long and narrow, the secretion will flow into the preputial sac. If the prepuce is now retracted and the glans laid bare, exposing at the same time the inner layer, both appear to be covered with pus, which really comes from the urethra. This appearance leads careless observers to make the diagnosis of balanitis. In order to avoid mistakes it must be remembered that in balanitis the surface of the glans and inner layer of prepuce is not alone covered with pus, but also reddened, swollen and inflamed. If the pus is removed and the underlying tissue found pale and normal, balanitis is excluded.

But if these parts are found red and swollen it must also be remembered that an urethritis may also be present, in addition to the balanitis. In order to convince ourselves the pus is wiped out of the preputial sac or washed away with the irrigator, after the patient has not urinated for several hours. Pressure is now made on the orifice of the urethra. If this forces pus from the urethra which contains gonococci under the microscope, the diagnosis is clear. If pus does not appear at the meatus, the patient is directed to urinate in two portions, and the cloudiness of one or both portions reveals the diagnosis and localization of the urethritis.

If phimosis is present, the pus escapes from the orifice of the prepuce. There are then two possibilities. 1. Blenorrhœa may be combined with the phimosis, or, 2, the balanitis is the cause of the phimosis. We must then ascertain whether the suppuration comes from the preputial sac or from the urethra.

In order to answer this question the patient is directed to hold his urine for several hours, and then the pus is washed out of the preputial sac by means of an irrigator and narrow drainage tube, which is carried into the sac, or by a syringe with a long narrow tip, which may be inserted between the glans and prepuce. The patient then micturates. If the urine is clear, the pus comes from the preputial sac, while a purulent cloudiness of the urine can only come from the urethra.

But it must not be forgotten that when the suppuration is present in the preputial sac alone, *i.e.*, when blenorrhœa is excluded, the balanitis may owe its origin to a soft chancre, to syphilis in all its stages, or to carcinoma. The pus of soft chancre is inoculable. It would, therefore, only be necessary to inoculate the patient by the aid of a lancet, with the pus obtained from the prepuce. But this procedure is usually superfluous, and is to be decidedly discountenanced in private practice. Nature often performs this inoculation for us. The pus flows upon the scrotum, thighs, margin of the prepuce, macerates these parts and produces eczema. These eroded and macerated places are infected by the pus, and we usually find, in such cases, soft chancres on the margin of the prepuce, scrotum and thighs. On the other hand, the phimosis offers favorable conditions for absorption of pus on account of its retention, and thus for the development of adenitides. Hence, soft chancres, which are complicated by phimosis, are usually followed by acute adenitis.

If the phimosis results from a syphilitic sore, its rigidity is usually felt from the outside. An indolent, nodular lymphangioitis, multiple indolent glandular swellings, and recent secondary symptoms, confirm the diagnosis.

If the phimosis is the result of secondary papules—a rare event—the case is cleared up by other older symptoms of syphilis, papules on the buccal mucous membrane and around the anus, palmar and plantar psoriasis, pustules on the head, eruptions on the trunk.

The diagnosis of phimosis due to gummata follows the demonstration of old syphilis, residua of the secondary period, old and recent tertiary symptoms. The diagnosis is further fortified by the long existence of a firm nodule, which is felt through the external coverings, by the absence of glandular

enlargements and recent secondary symptoms, and finally by the results of treatment.

When carcinoma is the cause of the phimosis we find considerable long-standing, usually ichorous destruction of tissue; absence of inflammatory symptoms; the characteristic, multiple, metastatic glandular enlargements, as hard as bone, and a cachectic condition.

Finally, acute development, slight increase in the size of the glans and absence of complications favor the diagnosis of balanitis alone as the cause of the phimosis.

Treatment.

In simple balanitis, uncomplicated with phimosis, whether with or without blenorrhœa, the treatment is quite simple. Cleansing and evacuation of the pus several times a day, drying and isolation of the inflamed surfaces, are the indications. The patient bathes the penis, with the prepuce retracted, two or three times a day in not too cold water, to which carbolic acid or chloride of zinc (1 per cent.) has been added, then removes the pus with cotton and dries the parts. The glans is then covered with a thin layer of pure dry cotton, over which the prepuce is drawn. Or a bland powder, such as rice powder or talcum venetum, is strewn thickly on the glans and coronary sulcus, and the prepuce drawn over it. Erosions are cauterized with solid nitrate of silver, or the entire preputial sac is brushed with a 50 per cent. solution. The patient may also use nitrate of silver (gr. vij. : ℥ v.) for irrigation. Resorcin (5 to 10 per cent. solution) as a bath or brushed upon the preputial sac also gives good results.

Chichester (1891) recommends brushing with

℞	Atropin. sulph., ...	gr. ¾
	Zinc. sulph., ...	gr. iss.
	Acid. boric., ...	gr. iv.
	Aq. destil., ...	℥ i.

Tannin, used as a dusting powder, effects rapid recovery. This may also be applied for a long time to harden a delicate, tender glans and internal lamella, and thus prevent balanitis.

If phimosis is present, the chief indication is the evacuation of the secretion. Recovery is usually effected rapidly by injections of a weak solution (gr. vij. : ℥ v.) of nitrate of silver or resorcin (5 to 10 per cent.). Zeissl recommends rapid cauterization by passing the solid stick between the glans and internal lamella.

More violent inflammatory symptoms are combated by rest, elevation of the penis, moderate antiphlogosis; œdema is relieved by scarifications. If the œdema is pronounced, and gangrene is threatening or beginning, we must avoid vigorous antiphlogosis, inasmuch as this favors the spread of the gangrene by interfering still more with the circulation.

If the phimosis cannot be relieved by antiphlogistics, and gangrene is impending or has already developed, a dorsal incision must be made or circumcision performed.

Balanitis in the bridged portions of the coronary sulcus heals on dividing the bridges with a bistoury or pair of scissors.

When balanitis and phimosis are present, a coincident urethral gonorrhœa cannot be treated locally until the former have subsided.

II. FOLLICULAR AND CAVERNOUS INFILTRATION AND ABSCESSES.

Symptomatology.

Although the blenorrhagic process is confined chiefly to the surface of the mucous membrane, there is hardly a case of acute urethritis in which at least some of the numerous follicles and glands in the mucous membrane are not implicated in the inflammatory process. We have already called attention to the fact that palpation of the pendulous portion during acute inflammation often reveals a series of larger or smaller nodules (sometimes as large as a hemp seed) which cannot be found in the normal urethra. These nodules—the larger ones are somewhat painful—are enlarged follicles. In many cases the inflammation is confined to the follicles, or spreads at most to the innermost layers of the peri-follicular connective tissue, and then constitutes a relatively slight affection. This can be followed most accurately at the orifice of the urethra. Both labia contain rather large follicles, which take part not infrequently in the blenorrhagic process. We then notice some-

what more marked swelling and redness of the labia, and if the latter are separated, cleansed of pus and pressure exerted upon them, pus will escape on both sides from one or two narrow openings. These openings, which admit fine probes, lead into canals ½ to 1 ctr. long. This affection is especially frequent in connection with slight hypospadias, when the glands and their openings are usually larger.

The inflammation of the glands and follicles may become more intense and diffuse, the perifollicular tissue assuming a more prominent part. This is owing to the increased inflammation from occlusion of the excretory ducts, by inflammatory swelling or firmly adherent plugs of mucus and pus—a condition that is apt to develop in view of the long, oblique course of the ducts through the mucous membrane. Or the inflammation may be intensified by external mechanical, traumatic and chemical irritants.

At the frenulum the environs of these follicles are formed exclusively of connective tissue, which here occupies the entire breadth of the frenulum and fills up the space left by the corpus cavernosum glandis. At the frenulum, likewise, there are a large number of these follicles and glands, which empty into the fossa navicularis, and inflammation is frequent here. We then find on one or both sides of the frenulum, in the niche formed by it with the coronary sulcus, a moderately firm, nodular swelling, covered by reddened skin, which is painful on pressure and may attain the size of a pea; this soon softens, perforates and discharges a little pus. Examination with the probe shows a small cavity which does not usually communicate with the urethra. Rupture into the urethra is rare. If two symmetrical infiltrations form to the right and left of the frenulum at the same time, they often become confluent, push forward the frenulum, which presses upon the middle of the single nodule by a cicatrix and divides it into two halves. The suppuration in the nodule not infrequently coalesces before it ruptures externally, and, when this has happened, the probe discloses a cavity beneath the frenulum, opening on either side, and thus undermining the frenulum. Œdema of the glans and prepuce, pain on contact, erection and micturition, are the further symptoms of this still mild affection, which presents the disadvantage, however, of being apt to return on renewed infection.

In all other parts, with the exception of the fossa navicularis, the glands and follicles are imbedded either in part or entirely in the cavernous tissue. If the inflammation extends beyond the boundaries of the follicular and perifollicular connective tissue, it must pass into the cavernous tissue. So-called cavernous infiltrations then develop from the perifollicular inflammation. Starting from a small, painless, follicular infiltration there develops, usually rapidly and attended with quite violent pains, a nodule which may grow to the size of a pea or hazel nut. It is situated in the corpus cavernosum urethræ, from which it projects like a nodule, and in the beginning is covered by the movable integument of the penis. Violent pains, spontaneous and on contact, exacerbation of the pains during erection, slight febrile movement, are the attendant symptoms. In some cases of marked swelling the stream of urine is materially narrowed. Resolution may set in if the inflammation of the gland resulted from closure of the excretory duct and the plug becomes loosened. But the closure of the duct usually results from swelling of the mucous membrane over the nodule. Softening of the nodule commonly occurs under such circumstances. The skin of the penis becomes reddened over the nodule and applied to it. In the meantime the internal wall, formed of the more delicate mucous membrane, may have yielded, the abscess discharges into the urethra, and a small flow of bloody pus escapes from the meatus. If urine enters the open abscess cavity at the next micturition, urinary infiltration and extensive cavernitis may result.

In other cases rupture occurs externally and internally at the same time. During micturition the urine passes through the internal opening into the abscess cavity and then out through the external opening. This diminishes the danger of urinary infiltration, but opens the way for a urinary fistula, inasmuch as the urine which escapes through the abscess cavity prevents complete healing. The most rare and favorable termination is that in which the abscess ruptures externally alone and then usually heals rapidly.

These circumscribed infiltrations may develop in all parts of the pars cavernosa. The favorite site is the bulb, in the first place because this is very rich in glands and follicles, then because stagnation of pus at the bulb and external injuries are apt to cause intensification of the inflammation. The swelling,

which is very painful and more extensive than in other parts, is not round but is sharply defined, round posteriorly, terminating in a point anteriorly; when very large, it always interferes with micturition, is accompanied by fever, and rapidly softens. Rupture internally furnishes very favorable conditions for urinary infiltration, especially as the bulb is so well adapted for the stagnation of the urine left in the urethra.

More extensive inflammations of the corpus cavernosum may also set in. These develop as the result of acute urethritis in various ways. They start from a folliculitis which has ruptured internally, from rupture of the urethral mucous membrane during vigorous erections, coitus, "breaking a chordee," or violent irritation affecting the inflamed mucous membrane.

If the process was preceded by folliculitis with rupture internally, the patient suffered first from the symptoms of the former affection, which rapidly improved after discharge of pus through the urethra attended by diminished size of the nodule. One or two days after the rupture, however, the former nodules increase rapidly in size and become very painful, and the previously circumscribed swelling extends over a large part of or the entire corpus cavernosum penis. The integument over the swelling is reddened, urination obstructed, the stream small and feeble, and micturition is attended with violent pain in the infiltration. The boundaries of the latter usually cannot be felt very distinctly. On account of this swelling the corpus cavernosum urethræ is fuller, as if semi-erect, so that the penis is curved, with the concavity towards the abdomen. If an erection occurs the corpus cavernosum urethræ, whose meshes are swollen and its cavities narrowed on account of the inflammation, cannot accommodate as much blood as the normal corpora cavernosa penis. It therefore becomes less erect and a curvature of the penis results, with the concavity downwards. This chordee is naturally attended with violent pain. If the cavernitis is due to urinary infiltration, purulent degeneration occurs with rupture externally, unless a more grave sequel sets in, *viz.*, ichorous, gangrenous destruction attended with severe febrile symptoms, which may prove fatal from pyæmia. If it is due simply to increase of the inflammatory phenomena, dependent on local irritation, the inflammation may terminate in resolu-

tion. It may also end in induration, conversion into fibrous connective tissue, which then causes permanent disturbances of erection, chordee and impotentia coeundi from obliteration of a portion of the corpus cavernosum. In a case of this kind A. Guerin (1854) found, on autopsy, that the spongy tissue had disappeared completely, and that the bundles which form the alveoli were thickened and inelastic. Tarnowsky describes a case of extensive acute inflammation involving all the erectile bodies. The patient had made an injection, by mistake, of a concentrated solution of nitrate of silver. Fifteen hours later Tarnowsky found him in bed, the penis completely erect, the skin reddened and hot, the slightest movement, even a current of air, produced the most violent pains. Bloody pus escaped from the urethra. Urination was impossible on account of the agonizing pains produced by the passage of urine through the canal. Even when at rest the pain was felt not alone in the entire penis, but also extended to the perineum, and was increased to the utmost by adduction of the thighs, so that the patient was forced to assume a semi-recumbent position with the thighs adducted and flexed at the knees. Leeches to the perineum, ice compresses, and inunctions of gray ointment resulted in resolution, but three months later an elongated induration, as large as a hazel nut, could still be felt at the middle of one of the lateral walls of the penis.

Chronic gonorrhœa is followed by complications of this kind much more rarely than the acute form. As the result of exacerbations the process sometimes spreads to one or the other follicle or gland, but the course of this folliculitis is subacute, and usually terminates in induration. On palpating the urethra of a man suffering from chronic gonorrhœa we then find one or more painless, firm nodules, perhaps as large as a hemp seed, in the course of the corpus cavernosum urethræ.

Stricture is a not infrequent cause of peri-urethral cavernous infiltrations in old chronic urethritis. Ulceration with urinary infiltration is a not uncommon retro-strictural change, and may give rise to cavernous infiltration. Inasmuch as the bulb is the favorite site of stricture, these changes are usually located immediately behind it in the pars membranacea, but may also appear in other places.

Kreiner reports a remarkably severe case of this kind, in

which there is doubt as to the origin from acute or chronic urethritis, because the patient did not come under observation until the changes were completed. In a waiter, æt. twenty-one years, who had entirely neglected a urethritis for three years, the following condition was observed: the penis is of moderate size as if semi-erect, curved slightly to one side, the glans disproportionately thick, of a bluish livid color, with numerous openings resembling the prick of a needle. The posterior segment of the frenulum præputii is very thick, and two rather large openings are found on either side. On palpation the urethra and its corpus cavernosum, from the middle of the pendulous portion to the external orifice, is found to be very thick and hard, as if it contained an elastic catheter of large calibre. Here and there an induration as large as a pea. The glans penis feels like a large callosity, the meatus is retracted by cicatricial tissue and very narrow, so that only a fine bougie is introduced with difficulty; it is almost entirely covered by proliferating granulations which start from its ulcerated border. If the urethra is squeezed moderately from behind forwards, creamy pus appears not alone at the meatus but also at the previously mentioned openings in the glans, as if from a sieve. The patient micturates with difficulty, using the abdominal muscles, and the stream is very small and spiral; the urine trickles from the openings in the glans and spirts in two very fine streams from the openings alongside the frenulum. This also occurs if fluid is injected into the urethra by means of Sigmund's syringe.

Finally, we must mention another change, *viz.*, chronic induration of the corpora cavernosa, which does not follow florid blenorrhœas, whether acute or chronic, but develops in an insidious manner after such processes have run their course. This condition is mentioned by Tarnowsky, Van Buren and Keyes and Mauriac.

This consists of a painless, chronic thickening of the corpora cavernosa. The patient first experiences some pain during erection, and on palpation finds a firm nodule in one of the corpora cavernosa. This can also be felt when the penis is flaccid. It slowly enlarges. When it becomes almost as wide as the corpus cavernosum it causes disturbance during erection, but remains firm and painless. If the size increases still more, the penis becomes bent during erection. In some cases

the induration has a flat shape, is firm and elastic but stretches very little, so that it hinders erection; it never extends through the entire thickness of the corpus cavernosum. Several nodules sometimes develop in one or both corpora cavernosa.

The diagnosis of these forms is evident from the symptomatology. Acute forms, without coincident blenorrhœa, are not observed unless there have been local injuries of a traumatic nature. The inflammatory symptoms, the infiltration felt on palpation, the demonstration of blenorrhœa, enable us to make the diagnosis without difficulty. In chronic induration syphilis must be taken into consideration. The previous history and the demonstration of luetic symptoms furnish the basis for treatment, which is also effective in the blenorrhagic affection.

The prognosis should never be made unqualifiedly favorable. Even the mildest forms of follicular abscesses may give rise to urinary infiltration. This condition always impairs the prognosis materially, on account of the danger to the potentia coeundi from extensive destruction of the corpus cavernosum, the possibility of a permanent urinary fistula, finally, of pyæmic symptoms. Chronic induration, which is with difficulty amenable to treatment, cannot endanger life, but threatens the potentia coeundi.

Treatment.

The first indication is complete rest, of the body as well as of the genitalia. If possible the patient should be kept in bed, sexual excitement combated in the well-known ways, the food should be bland, and easy evacuations should be secured. All local treatment of the gonorrhœa, whether external or internal, should be discontinued at once.

In recent infiltrations, which show no softening or fluctuation, vigorous antiphlogistic measures must be adopted at once. Cold compresses are first applied assiduously. When the pain has disappeared, absorption is aided by inunctions of gray ointment. If fluctuation or softening is noticed, immediate incision will prevent rupture internally. If rupture internally has occurred, communication is established by incision of the abscess externally, and the case treated according to surgical principles. Threatening urinary infiltration and fis-

tula are avoided by the introduction of an elastic catheter à demeure. This should also be done, and an external incision made, even after urinary infiltration has occurred.

If a fistula remains after recovery, it must be treated surgically. Indurations, whether chronic or the residua of acute inflammation, are treated with vapor compresses and application of iodine. Until the infiltrations have entirely disappeared, erections and coitus must be prevented, because they may be followed by very serious consequences as the result of rupture and hemorrhage.

Folliculitides of the urethral meatus are treated by the passage of a narrow stick of lunar caustic or hot needles into the gland. If hypospadias is also present, the excretory duct of the gland may be divided.

In undermining of the frenulum by abscesses complete division of the remaining bridges is indicated.

III. INFLAMMATION OF COWPER'S GLANDS.

General Remarks.

Although Cowper's glands had been described by Méry in 1684, and Cowper described them anew in 1702, their pathology long remained obscure. Cowper attributed the discharge of vitreous, tough fluid at the end of an urethritis to disease of these glands, and also reported a case of ulceration of the excretory duct. Littré (1711) also brought chronic urethritides in connection with disease of Cowper's glands, and described a case of swelling of the gland with ulceration of the excretory duct. In an autopsy on a young man Morgagni found narrowing of the excretory duct as the result of a cicatrix. Hunter mentioned Cowperitis cursorily, and recommends vigorous treatment with mercury. B. Bell regarded it as a dangerous complication of urethritis, which gives rise, in some cases, to an incurable urethral discharge. Swediaur mentioned retention of urine from enlargement of the gland. Gubler (1849) was the first to give a detailed account of the diseases of Cowper's glands in a thesis prepared under Ricord's supervision. In 1849 Linhart presented to the Vienna Medical Society two preparations, one of suppuration of Cowper's gland with gangrene of the mucous membrane of the

urethra, the other of suppuration of the middle lobe of the gland. Other cases have been reported by Bartels, Nicolle, Ravogli and Rasori, and Bowie, but the affection is rare and relatively little studied.

Symptomatology.

Acute Cowperitis is almost always a complication of acute gonorrhœa. At the end of the second week after infection the inflammation reaches the bulb into which the excretory ducts of Cowper's glands empty, so that Cowperitis cannot develop before this period. Fournier states that the third and fourth weeks of acute urethritis are the favorite period for the occurrence of this complication.

In some cases the spread of the inflammation is provoked by injuries which increase the intensity of the blenorrhœa, such as traumata, excessive movement, riding, dancing, coitus, strong injections or introduction of bougies. In other cases no exciting causes are found, the inflammation appears to develop spontaneously. In Tarnowsky's case an acute Cowperitis developed in a chronic urethritis of two years standing, as the result of prolonged riding.

The symptoms and course of the disease are usually simple. At first the patient generally feels a sticking pain in the perineum, which leads him to make an examination. On palpation, which is always accompanied by pain, a sharply defined nodule is felt a little behind the bulb, *i.e.*, about half way between the posterior edge of the scrotum and the anus, and to the side of the median line. This is about as large as a hazel nut at the beginning, grows more or less rapidly, is sharply defined and covered by movable integument. The blenorrhagic secretion from the urethra diminishes or ceases entirely. Micturition is undisturbed, defecation is attended with pain in the perineum. The clinical history is not infrequently confined to these symptoms, which diminish, and the disease is then cured or the inflammatory symptoms disappear, while the nodule remains and becomes indurated.

In other cases, however, the inflammation progresses, the nodule becomes as large as a nut or even larger, and the skin is pushed forward. It usually loses its sharp boundary and becomes elongated, the anterior smaller extremity reaching to

the bulb, or it extends along the corpus cavernosum while the posterior blunt extremity ends at the transverse perineal fascia. The inner border may reach the median line or even pass beyond it, but the tumor is always asymmetrical on account of its predominantly lateral development. The swelling then has a doughy feel and is covered by inflamed, reddened skin. Compression of the urethra in these cases interferes with micturition, the stream is narrow, the symptoms like those of stricture.

Fever, chills and throbbing pains in the tumor are signs of beginning suppuration, which usually perforates externally in a few days, and often discharges astonishing amounts of pus. The pain and disturbances of micturition then cease, and the urethral discharge, if it has been in abeyance, returns. The abscess cavity fills with granulations and usually heals rapidly. The retraction of the recently formed cicatricial tissues may cause compression and distortion of the urethra and thus narrowing of its lumen, as in Bartel's case.

Perforation internally is more rare, and still rarer is perforation in both directions at the same time. Much then depends upon the course followed by the urine. Even despite perforation internally the urine does not enter the abscess cavity in many cases, and recovery rapidly follows. In such cases the perforation may be situated in such a position that the stream of urine, which distends the urethra, closes the opening. The urine may also not escape when the perforation has taken place internally and externally. In other cases the urine enters the abscess cavity and then passes through the perineum, if external rupture takes place. Urinary infiltration and fistula are the result.

But Cowperitis does not always run such an acute course in all cases. Tuffier reports the case of a patient, æt. sixty years, who died of emphysema. He had suffered from blenorrhœa and dysuria, which were found, during life, to be due to stricture of the urethra. The autopsy showed that the stricture resulted from an abscess of Cowper's gland which projected into the urethra. In Hamonic's case a man of twenty-two years, of a tuberculous family, who presented the symptoms of bronchitis at the apex, acquired an urethritis. In the third week a painless tumor developed in the perineum. Five weeks after infection it was as large as a walnut, pain

less, doughy, covered with pale skin, and fluctuating. The tuber ischii was tender on pressure and appeared to be connected with the tumor by a band. Hamonic made a diagnosis of cold abscess from disease of the os ischii. An incision discharged pale yellow pus, but no rough bone could be felt. The abscess cavity was lined by a thick pyogenic membrane. Extirpation and anatomical examination showed inflammation of Cowper's gland. Tuberculosis was excluded histologically and bacteriologically.

Bilateral Cowperitis is rarer than the unilateral form. The symptoms are the same, but the swelling is bilateral or symmetrical from confluence. The pressure on the urethra and the subjective symptoms are more marked. Perforation externally is usually later on one side than on the other, and this leads not infrequently to communication of both abscesses and thus to exposure of the posterior periphery of the bulb; this may result in serious fibrous compression when the abscess heals. In these cases the infiltration in the perineum generally extends to the anal opening and upward along the latter, but is always separated from the prostate by a groove.

According to Ricordi and Jullien, chronic Cowperitis runs a different course, being manifested only by a morbid secretion without subjective symptoms. In some cases this secretion is opaline and occasionally becomes purulent, and cannot be distinguished from that of chronic urethritis. In other cases the discharge, which passes the meatus in the morning, is a gelatinous, stringy mass, which is found under the microscope to contain the epithelium of Cowper's glands.

In the absence of *post-mortem* examinations and the striking similarity of the symptoms with those of chronic urethritis, the question of the existence of chronic Cowperitis must remain an open one. I have never observed such cases.

Diagnosis and Differential Diagnosis.

This is evident from the symptoms, but it is especially the inflammation limited to the gland which cannot easily be mistaken. In advanced cases the diagnosis becomes more difficult. It is then possible to mistake it for simple cutaneous abscess of the perineum, cavernous infiltrations and abscesses of the bulb. The cutaneous abscesses, however large they

may be, are not apt to cause compression of the bulb. Abscesses of the bulb are distinguished by their median, more anterior position, from the asymmetrical, more posterior Cowperitides. Urinary infiltrations resulting from stricture are recognized by the fact that they follow chronic urethritis, have long been preceded by symptoms of narrowing, and that the narrowing does not disappear after perforation or incision.

Prognosis.

This is favorable when the disease is confined to the gland, but a guarded prognosis should always be given when the inflammation extends to the peri-glandular tissue, inasmuch as urinary infiltration, fistula, and fibrous compression of the urethra may give rise to disagreeable or even dangerous symptoms.

Treatment.

This consists simply of the cessation of all local treatment of the urethritis, rest, and cold compresses and ice-bags to the perineum in the acute stage, if no fluctuation is felt. If fluctuation is present it must be treated surgically by immediate incision. Induration of the gland or peri-glandular tissue disappears on inunction of gray ointment or application of vapor compresses.

IV. INFLAMMATION OF THE PROSTATE.

General Remarks.

That the prostate may take an active part in the blenorrhagic process is an old experience. Indeed the part played by this organ was often exaggerated in former times. Thus, Zeller, Littre and Warren regarded clap as an inflammation and suppuration of the prostate. This view was owing to the fact that an autopsy is rarely held on simple, uncomplicated gonorrhœa and only as the result of intercurrent affections, while urethritis only terminates fatally when aggravated by severe complications, among the most prominent of which is prostatitis.

The prostate also played a large part in the pathology of clap even after clearer views of the nature of the disease were entertained. Thus, Swediaur and Girtanner (1803) located chronic blenorrhœa in the prostate, claiming that the latter was more or less affected in almost every case. The prostate sometimes remained swollen, large and hard, even after complete recovery from the clap. The hardness and enlargement increase until finally the prostate occludes the neck of the bladder. Wendt (1827) thought that the prostate is more or less implicated in every violent gonorrhœa, and Vidal (1854) believed that clap plays its part in the etiology of prostatic hypertrophy of old age.

Accurate investigations have shown that the prostate may be affected as the result of acute as well as of chronic gonorrhœa. We must therefore distinguish acute as well as chronic diseases of the prostate, which generally follow the corresponding forms of urethritis. The spread of the process is due to various causes, but they always consist of irritants which gives rise to exacerbations of the urethritis, such as excesses in Baccho et Venere, immoderate exercise, local irritation (strong injections, catheterization, etc.). Certain prostatitides develop spontaneously or at least without any ascertainable cause. The ready passage of the inflammation from the mucous membrane to the prostate is explained by their intimate anatomical connection.

Symptomatology.

Acute Prostatitis.—Implication of the prostate in acute urethritis from direct continuation of the inflammation from the mucous membrane can only occur, as a matter of course, when the pars prostatica is the site of the blenorrhagic process. Hence posterior urethritis alone is followed by prostatitis, and the latter will not appear until the third week after infection. An exception obtains in those cases in which pus is carried into the pars posterior at the beginning of an acute urethritis by instrumental examination.

According as the extension of the blenorrhagic process to the pars posterior occurs acutely (on account of external injuries) or spontaneously and slowly, it will be accompanied by the well-known symptoms or run a latent course.

The development of prostatitis is therefore either preceded by the symptoms of acute posterior urethritis or the latter are absent.

Or the extension of the process to the pars posterior may be almost or entirely coincident with the acute prostatitis, so that the symptoms of both will occur together.

I cannot state in figures the frequency with which acute posterior urethritis is complicated by prostatitis, but it is undoubtedly very frequent. Sigmund (1858) believed that every clap which had lasted several weeks was followed by swelling of the prostate, which is often very considerable, and which may not disappear even after recovery from the clap. Montagnon and Eraud state that the prostate is attacked in 70 per cent. of the cases of posterior urethritis.

The prostate may take part in acute posterior urethritis in four different ways.

Congestion of the Prostate.—This is the most frequent form. The posterior urethritis has begun either in the well-known way or has developed in an entirely latent manner, when the patient complains of a feeling of pressure and weight in the perineum and fullness in the rectum. Vesical tenesmus is somewhat increased, and defecation is apt to be painful, especially if the fæcal masses are firm. On examination per rectum the prostate is found enlarged, either uniformly or irregularly, feels warmer, and is painful on pressure. The urethral secretion does not diminish, the test of the two beakers shows cloudiness of both. This condition lasts so long as the acute stage of the blenorrhœa continues and disappears spontaneously in a few days. External irritants at this time, particularly injections and coitus, may increase the congestion and give rise to inflammation. Frequent pollutions, resulting from the increased sexual excitability induced by disease of the pars prostatica, may have the same effect. But we must be on our guard against declaring every tenderness of the prostate on pressure through the rectum as congestion, because this may be simulated by the mere tenderness of the pars prostatica.

Acute Folliculitis.—Usually during the stage of acute posterior urethritis, or when exacerbation of an inflammation of the pars posterior, which has run its course, results from external injuries (injections, coitus, onanism), the patient ex-

periences an increasing vesical tenesmus, generally within six to twenty-four hours after the action of the exciting cause. As a rule the tenesmus lasts only a few hours, at the most a day, and compels the patient to urinate every half hour or even more frequently. The increased secretion of pus, which would otherwise have followed the exciting cause, remains absent, but both portions of urine are cloudy. The cloudiness is mucus, and is deposited after a long time in the shape of small flakes. The addition of acetic acid sometimes causes partial clearing up, an evidence that phosphaturia is also present. The contraction of the neck of the bladder on the passage of the last drops of urine, and the elevation of the perineum by its muscles, are attended by a burning or shooting pain which the patient often locates accurately in the same point. Micturition is also attended with a burning pain in a fixed point of the deepest portion of the urethra. On rectal examination the prostate hardly appears to be enlarged, but one or two firm nodules as large as a pea, which are sharply defined from the remaining soft parenchyma, can be felt, usually only in one lobe. Pressure on these nodules causes shooting pains. If no further morbific influences are at work the subjective symptoms disappear rapidly, the nodules are absorbed, and the original condition returns or an exacerbation of the urethritis sets in. If these nodules suppurate, they perforate towards the urethra and recover, leaving small cicatrices. When the latter are situated in the neighborhood of the ejaculatory duct, they may occlude the duct, as I have found on autopsy. Oligospermia is produced in unilateral closure of the duct, aspermatism in bilateral closure.

Parenchymatous Prostatitis.—This may develop directly or from either of the previously mentioned forms. It usually begins with increased tenesmus, a feeling of fullness in the rectum and pressure on the perineum. The secretion disappears, fever sets in and all the symptoms are aggravated. Micturition is obstructed by the swelling of the prostate, and a small stream is discharged, with violent contraction of the abdominal muscles. Defecation is very painful from pressure on the swollen gland. At the same time there are spontaneous, violent, shooting or boring pains in the perineum, which radiate towards and along the urethra, and also towards the rectum, small of the back, and thighs. Some patients describe a sensation of a painful "nut" in the rectum. Rectal tenes-

mus is also distressing. Pressure on the perineum is painful, so that the patients are usually unable to sit, but assume a recumbent position with flexed thighs. Rectal examination in these cases often shows very considerable swelling of the prostate, which is tender on pressure, warm to the feel and projects far into the rectum. The symptoms increase in severity for five to six days. The enlargement of the gland may cause complete retention of urine and fæces which, associated with the constant vesical and rectal tenesmus, entails the greatest distress. Towards the end of the first week the symptoms may rapidly subside and the enlargement of the gland disappear, or suppuration occurs, attended with increased pains, which assume a throbbing character, and chills which occur on one or more evenings. The purulent degeneration then proceeds rapidly, and distinct fluctuation is felt per rectum in three to four days. If the process is left to itself perforation sets in, the capsule in which the pus is situated yielding at some point. If this is towards the urethra the pus will empty into the latter. The patient then experiences an acute pain, usually during defecation or micturition, and a stream of bloody pus flows from the urethra. The rupture is followed by rapid remission of all the symptoms.

Or the capsule ruptures at some other point and the pus passes into the loose cellular tissue and between the fasciæ of the pelvis. It may make its way either toward the rectum, into which it perforates, or towards the perineum. Here a swelling forms, above which the skin reddens and softens, and rupture takes place. Various remarkable paths may also be followed by the pus. Among 102 cases, collated by Segond (1880), the discharge occurred in

64 cases into the urethra.
43 " " " rectum.
15 " " " perineum.
8 " " " ischio-rectal fossa.
3 " " " inguinal region.
2 " through the obturator foramen.
1 case " " umbilicus.
1 " " " sciatic foramen.
1 " at the edge of the false ribs.
1 " into the abdominal cavity.
1 " " " cavity of Retzius.

In simple cases the formation of granulation now begins in the abscess cavity, and rapid recovery follows.

But the proximity of the urethra, bladder, and rectum furnish so many dangers for inoculation, which may also occur from the outside. And so the entrance of urine or fæces, and therefore urinary infiltration, septic infection, gangrene and pyæmia, are not uncommon terminations.

Coincident perforation into the urethra and the rectum or perineum may form an unnatural passage for the urine, which may lead to infiltration or the development of annoying fistulæ.

Parenchymatous prostatitis is, therefore, a very serious affection. Among Segond's 114 cases recovery occurred in 70 cases; death occurred in 34 cases; urinary fistulæ occurred in 10 cases.

In addition to the termination in complete resolution and in suppuration there is a third and rarer termination, *viz.*, induration. The acute symptoms and subjective phenomena disappear, but rectal examination shows that the prostate is distinctly enlarged and firm. This enlargement may diminish gradually, or it is followed by hypertrophy of the prostate.

Unlike the acute forms just described some cases run an insidious, torpid course. Some external injury is followed by slight vesical tenesmus, which is not very annoying to the patient. Local remedies are discontinued, but the secretion remains profuse. Five or six days later, during which time the patient attends to business, and can ride, walk and sit without difficulty, chill and fever set in, with some pain in urination and defecation. On examination per rectum we are greatly astonished to find a large, already fluctuating enlargement of the prostate. Pitman describes a case of this kind and I have observed several, so that I lay it down as a rule that the prostate should be examined at once whenever fever occurs during the course of gonorrhœa.

Periprostatic Phlegmons.—Paupert, Parmentier and Dubreuil call attention to the fact that inflammation of the periprostatic tissue results not so very rarely from the same causes as parenchymatous prostatitis. The prostate is surrounded by firm cellular tissue, especially behind and below. Collections of pus form here, and first extend upward between the prostate and rectum, and may even detach the perito-

neum. The pus then usually seeks the perineum and may perforate here or even into the bulb of the urethra. It forms more rarely between the prostate and the urethra. The symptoms are very like those of acute prostatitis; the diagnosis is based on examination per rectum which shows that the prostate is intact. As rupture occurs usually into the perineum, more rarely into the rectum, the course is generally favorable, and urinary infiltration and gangrene are not so much to be feared.

Chronic Prostatitis.

This may develop as the residuum of acute, especially follicular, prostatitis, or may begin as a chronic affection as a complication of chronic urethritis. It is so closely connected with the symptomatology of one of the forms of chronic posterior urethritis that we have already described it. I will here content myself with recalling attention to the cardinal symptoms, prostatorrhœa and sexual neurasthenia, without entering again into a detailed description.

Pathological Anatomy

Apart from the older autopsies, which refer chiefly to suppurating prostatitis, we owe our knowledge of the pathological anatomy to Home, Hamilton and Thompson, though it is still defective on account of the lack of sufficient material. Thompson describes the changes in acute prostatitis as follows: The prostate is swollen to three or four times the normal, and feels firm and tough. The arteries are filled with dark blood, and the mucous membrane of the pars prostatica is dark red. On section the tissues appear redder than normal. Pressure expresses a large amount of reddish fluid, which is found, under the microscope, to consist of lymph, blood, prostatic fluid, and a small amount of pus. As the inflammation progresses the amount of pus increases, and on section through the lobes of the prostate, small drops of pus emerge from the glands. In advanced stages we find more or less numerous foci of pus, from the size of a hemp-seed to that of a pea, scattered through the substance of the prostate. This pus has one peculiarity, *viz.*, that it is mucous, sticky, and mixed with blood. The

prostate may be softened and gangrenous in small spots, the mucous membrane of the urethra is reddened and thickened, perhaps covered by false membranes, or it is partly destroyed by ulceration or gangrene. One or more of the purulent foci in the prostate empty directly upon the mucous membrane.

In chronic prostatitis Thompson found the prostate sometimes enlarged, sometimes very small, its consistence softened, even spongy. A section has a dark red to violet color, pressure discharges abundant dark fluid. In advanced cases circumscribed deposits of pus are found, perhaps as large as a hemp-seed. The mucous membrane of the pars prostatica is thinned and very vascular, the openings of the prostatic glands are extremely large; more rarely the mucous membrane is thickened and has a livid red color. Pus is found not infrequently in the sinus pocularis, the excretory ducts of the glands, and in small cavities which communicate with the urethra, and also in cavities within the periprostatic cellular tissue. In Fuerbringer's (1884) case, the gland was enlarged and infiltrated with broad, firm, ivory-white bands of cicatricial connective tissue. The walls of the excretory ducts were hyperplastic and infiltrated with small cells; the ducts were distended with an opaque mucous fluid like that described in the symptomatology of prostatorrhœa. The glandular tissue proper presented, in places, marked swelling and cloudiness of the epithelium with pronounced interstitial inflammation; no abscesses.

Diagnosis and Prognosis.

Acute prostatitis presents such typical symptoms that its diagnosis is unattended with difficulty. The only disease which may present analogous symptoms at the start is acute posterior urethritis, and this indeed takes part in the symptomatology of prostatitis. The differential diagnosis is made by examination per rectum, which should, therefore, not be neglected in any case of acute urethritis posterior. It is in this way alone that we can detect recent congestions and follicular inflammations, and thus prevent more serious parenchymatous inflammations.

The diagnosis of chronic prostatitis can be made at once by examination of the prostatorrhœic secretion, examination with the endoscope and sound, testing the urine, and by the recognition of sexual neurasthenia.

The prognosis of acute prostatitis should be guarded. The congestion and follicular inflammation and many parenchymatous inflammations terminate in resolution, but the effects of the latter form, which are not always under our control, are so serious that caution is advisable, even if the process is running a favorable course.

This is also true of chronic prostatitis, especially in view of the fact that the neurasthenia, which so frequently accompanies it, may persist after recovery of the local symptoms.

Treatment.

Acute Prostatitis.—The chief point in every inflammation is rest. And so in acute prostatitis we must secure rest in bed, and also rest for the organ, *i.e.*, avoid injections, give the well-known antaphrodisiacs (*vide* Treatment of Gonorrhœa) and secure easy and regular evacuations from the bowels. Strict antiphlogosis is indicated so long as suppuration cannot be found. All former measures have become superfluous since I devised an apparatus which permits the local application of cold. This (Fig. 33) is analogous to Arzberger's hemorrhoidal apparatus. It consists of a narrow metallic tip, 16 cm. long, whose cavity is divided into two parts by a septum extending almost to the end, and is connected with two tubes. The well-oiled tip is inserted into the rectum, the widest portion resting directly on the prostate. Cold, or even ice-cold, water is now allowed to flow through by syphon action, and this cold is conveyed to the prostate. This apparatus, applied for an hour two or three times daily, has done excellent service so long as suppuration was not noticeable. Two days' use suffices to dispel the inflammation, even in acute and considerable swellings. At the same time the instrument is easily inserted by the patient himself. In addition, further antiphlogistic and symptomatic treatment may be carried out. For example, inunctions of gray ointment to the perineum; if the pains and tenesmus are violent morphine internally, subcutaneously and as suppository. Narcotics are given to relieve the retention of urine, which, like the swelling, depends in great part on the spasm of the sphincters. It is only in case of urgent necessity that an elastic, narrow catheter is carefully passed into the bladder, but is then allowed to remain. If suppuration sets in, the case must be treated according to surgical

principles. An opening should be made, if possible from the perineum. At all events this is to be preferred to opening the abscess with the catheter from the urethra. If possible, *i.e.*, if the catheter in such a case does not catch in the opened abscess cavity, a catheter *à demeure* is inserted after the rupture into the urethra has taken place.

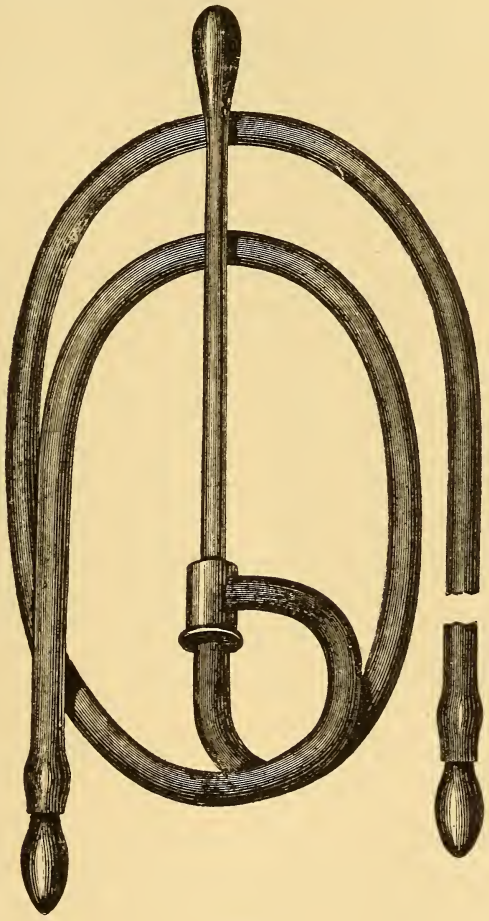


Fig. 33.

Chronic Prostatitis.—In this form the treatment of the prostatorrhœa and chronic urethritis is the most important.

The prostatorrhœa may be treated by the use of Winternitz's psychrophore, which I have previously described. In many cases the apparatus shown in Fig. 33 has been very use-

ful, but instead of cold water I apply warm water (37 to 42° C.) for an hour every day. Good results are also obtained from the subsequent application of the following suppositories:

℞ Potass. iodid., ... gr. vij
Iodin. p., ... gr. ¾
Extr. belladon., ... gr. j
Butyr. cacao q. s. f. suppositor. No. V.

Koebner (1889) recommends enemata of the following solution:

℞ Potass. iodid., ... ʒ iij.
Potass. bromid, ... ʒ ij.–iij.
Extract. belladon., ... gr. iiss.
Aq. destil., ... ℥ x.

This amount suffices for twenty enemata, two of which are given daily. Tincture of iodine, beginning with 3 drops and gradually increasing to 10 drops, may be added to each enema. Scharff (1892) recommends daily enemas of 10 to 50 per cent. solutions of ammonium sulfo-ichthyolicum.

The urethral treatment consists of the application of solutions of nitrate of silver (1 to 5 per cent.) or potassium-iodide iodine-lanolin ointments, particularly the latter. Good results often follow the introduction of sounds of large calibre.

The neurasthenia is often cured by the local treatment of the prostatitis. If neurasthenic symptoms remain after recovery from the prostatitis and chronic urethritis, they are to be treated by the cold-water cure, iron and arsenic, sea bathing, Playfair's cure, according to the severity of the process.

V. INFLAMMATION OF THE EPIDIDYMIS.

General Remarks.

The knowledge of this, the most frequent complication of the blenorrhagic process, is almost as ancient as that of gonorrhœa itself. But we possess no accurate data concerning the frequency of its occurrence.

Rollet observed 678 cases of epididymitis (27.9 per cent.) among 2425 cases of clap; Jullien 381 (15.2 per cent.) among 2500 cases; Tarnowsky 673 (12.2 per cent.) among 5203 cases, and I observed during a five years' hospital service, 548 (29.9 per cent.) epididymitides among 1844 cases of urethritis. But all

these figures are derived from hospital material, and hence are certainly too high, because it seems evident *à priori* that patients suffering from epididymitis, being unable to work, will then enter the hospital in larger numbers than those suffering from simple urethritis. In fact, Berg, taking his statistics from private practice, states that he has seen epididymitis in 7.5 per cent. of all urethritides.

In the large majority of cases epididymitis is unilateral. It was maintained formerly that there is a great predominance on the left side, and various explanations were offered, for example, that the majority of men "dress" on the left side, so that the left testicle is exposed more readily to pressure and contusions. The predominance of left varicocele, the pressure exerted by the sigmoid flexure on the left vas deferens, were also mentioned as factors. But examination of a large statistical material shows that the difference between both sides is very small and requires no explanation.

The situation of the epididymitis is given as follows:

	Right side.	Left side.	Both sides.	Total.
Gaussaille,	45	24	4	73
D'Espiné,	12	11	6	29
Aubry,	40	52	7	99
Castelnau,	125	133	7	265
Curling,	21	14	1	36
Sigmund,	60	48	6	114
Fournier,	102	126	35	263
Turati,	191	192	25	408
Le Fort,	249	200	41	490
Ramorino,	29	37	—	66
Gamberini,	15	10	3	28
Breda,	64	53	4	121
Jullien,	167	182	33	382
Kuehn,	70	67	12	149
Unterberger,	35	25	5	65
Author,	275	251	22	548
	1500	1425	211	3136

From these tables it appears that the difference between the two sides is extremely small, and that bilateral epididymitis is rare.

This complication results from the direct continuation of the blenorrhagic process, and will only develop after the process has reached the pars posterior. Hence the earliest period, as a rule, is the end of the second or beginning of the third week. Exceptions may arise if the gonorrhœal pus is carried mechanically, at an earlier period, into the pars posterior, here produces inflammation and propagation to the epididymis. The statistics of Fournier, Le Fort, Gaussaille, D'Espiné, Aubry, Castelnau and Unterberger give the following results with regard to the onset of epididymis:

1 week after infection in	. . .	46 cases.
2 weeks " "	. . .	157 "
3 " " "	. . .	132 "
4 " " "	. . .	191 "
5 " " "	. . .	132 "
6 " " "	. . .	64 "
7 " " "	. . .	44 "
8 " " "	. . .	61 "
3 months " "	. . .	66 "
4 " " "	. . .	33 "
5 " " "	. . .	18 "
6 " " "	. . .	22 "
7 " " "	. . .	9 "
8 " " "	. . .	8 "
9 " " "	. . .	5 "
10 to 12 " " "	. . .	8 "
2 years " "	. . .	9 "
3 " " "	. . .	7 "
4 " " "	. . .	2 "
7 " " "	. . .	1 case.
		1015 cases.

Hence more than half of the cases (612 out of 1015) began two to five weeks after infection, and absolutely the largest number (191 cases) in the fourth week. Vidal and Sturgis also report the earlier occurrence of epididymitis, and even so critical and experienced an observer as Bergh states that in two of his cases the epididymitis developed soon after exhausting coitus, a few days before the discharge began, and in two others began with the discharge during the first week.

Nevertheless I am extremely skeptical concerning such statements, not that the patient always intends to deceive us, but how many individuals suffer from chronic posterior urethritis without knowing it, and cannot this produce epididymitis when an exacerbation results from pronounced morbific influences?

All those causes which give rise to exacerbations of urethritis, and which we have frequently referred to, also give rise to the development of epididymitis. Le Fort's statistics are interesting with regard to the statement so frequently made that the treatment of gonorrhœa is the chief cause of the development of epididymitis. 576 cases were classified as follows according to the previous treatment:

No treatment, ...	264 cases.
Balsams alone, ...	73 "
Injections alone, ...	82 "
Balsams and injections, . . .	60 "
Treatment unknown, . . .	97 "

The untreated cases, accordingly, are those in which epididymitis is most frequent. This is probably not due exclusively to the absence of treatment, but it is to be assumed that careless patients will add positive injurious influences to the negative one of absence of treatment. These include excesses in Baccho et venere, bodily strain, improper treatment.

Desprès (1878) attributes epididymitis to the retention of semen resulting from the continence rendered necessary by the blenorrhœa. It is true that individuals who remain continent during a long-continued blenorrhœa, suffer from pain along the vas deferens, dragging and heaviness in the testicles (seminal colic), but these are not apt to be mistaken for epididymitis, and we therefore adhere to the old view that this complication results much more often from losses than from retention of semen.

The pathogeny of epididymitis is not yet clear, but we will hardly go astray in regarding it as true blenorrhagic disease. Gonococci which have reached the pars posterior enter the ejaculatory duct and vas deferens, proliferate upon the surface of the epithelium, and finally reach the epididymis, where they produce inflammation. This inflammation, like all others which are due to gonococci, has less tendency to suppuration,

but exhibits a decided tendency to pass into a chronic stage, which is characterized by the production of abundant cirrhotic connective tissue.

According to this view every epididymitis would begin with a deferentitis. This is apparently contradicted by clinical observation, which shows that the disease begins in many cases in the epididymis, and the seminal duct is only affected later.

This contradiction is only apparent. In the first place, epididymitis does begin with pain and tenderness along the seminal duct. Furthermore, the later affection of the duct is only apparent.

So long as the gonococci multiply upon the epithelium of the vas deferens and reach the epididymis in this way, the clinically demonstrable implication of the former is slight. Those gonococci which remain in the vas deferens will pass through the epithelium into the connective tissue and substance of the canal. This penetration into the tissues produces the considerable thickening of the vas deferens which thus appears to follow the epididymitis. If the gonococci in the vas deferens or epididymis pass through these organs to the outer surface, they reach the serous cavity which surrounds a part of the vas deferens and the lateral borders of the epididymis. Here they produce acute inflammation with exudation, hydrocele testis et tunicæ vaginalis.

The frequency with which the vas deferens is affected is shown by Sigmund's statistics of 1,342 cases:

Epididymitis with vaginalitis,	856	cases.
" " funiculitis,	108	"
" " funiculitis and vaginalitis,	317	"
" alone,	61	"
	1,342	"

Symptomatology.

Acute epididymitis usually begins brusquely. A violent pain in the testicle is suddenly felt, "as if molten lead had dropped into the testicle," fever and malaise set in, and the disease is fully developed at the end of a few hours.

In rarer cases prodromal symptoms are observed. The

patients complain of general malaise, slight chilliness, and anorexia; then vesical tenesmus appears, with pain in the inguinal region, near the external ring, radiating towards the testicle and kidney, and finally persisting in the testicle. The secretion, which had been abundant hitherto, usually ceases. Among 141 cases examined by Aubry, the urethral secretion disappeared in 81, was materially diminished in 58 cases, and in only 2 cases did it increase with the onset of the epididymitis.

The most constant, often the sole symptom, is a suddenly occurring, fixed pain in one testicle. On palpation the patient usually feels a swelling as large as a hazel nut or walnut. This swelling is confined at first to the head, more rarely to the tail of the epididymis, is sharply defined, and is extremely painful on palpation.

The swelling extends very rapidly to the entire epididymis, and within twenty-four hours from the beginning of the affection the enlargement is visible to the eye, the integument of the affected side of the scrotum is red, warm and tense. On examination the normal testicle is found surrounded above, behind, and below by a semilunar, moderately firm and extremely painful swelling, the inflamed epididymis.

In many cases the process remains at this stage. The enlargement and tenderness of the epididymis and the violent spontaneous pains increase for a few days. The patient, unable to move on account of the threatened exacerbation of the pains, assumes the dorsal position in bed, and supports the affected side by drawing upon it and by partial flexion of the corresponding lower limb. In a few days the pains disappear spontaneously, the inflammatory stage is over.

In other cases the inflammation and swelling are not confined to the epididymis. It extends per continuitatem to the spermatic cord, attacking particularly the vas deferens. The latter appears firmer than normal, is tender on pressure, and can be traced into the external inguinal ring as a round cord as thick as a raven's quill. In some cases it can also be followed, per rectum, to the prostate as a firm, tender cord, and even the corresponding half of the prostate appears enlarged, firm and tender.

The entire spermatic cord may also take part in the inflammation. It is then swollen and shortened, so that the

affected testicle is drawn against the inguinal ring, and is the site of violent pains.

The inflammation may also extend to the tunica vaginalis, where it gives rise to increased effusion of fluid. At first the tunica vaginalis testis alone is attacked. Fluid escapes between the two layers, an acute hydrocele testis develops. The size of the affected half of the scrotum is materially enlarged by this very considerable and rapidly increasing swelling. The testicle itself can no longer be felt. It is enclosed in front and on the sides by a tense fluctuating tumor, behind which is the firm enlargement of the epididymis.

If, as a developmental anomaly, the two layers of the tunica vaginalis of the spermatic cord are not firmly adherent, an acute exudation may form between them, hydrocele acuta funiculi spermatici. We then find a fluctuating, tense, sausage-shaped tumor, which ends at the external inguinal ring.

When the swelling has thus attained considerable dimensions, the integument of the corresponding half of the scrotum does not remain entirely intact. It is stretched tightly over the tumor, and is also reddened, swollen, and adherent to the subcutaneous tissues (eczema glabrum).

In such a case all the tissues of the affected half of the scrotum participate in the inflammation. Concerning the condition of the testicle, which is concealed on all sides, we can obtain no information, but it appears to be the least affected of all.

All these changes may develop rapidly. The disease reaches its acme in four to five days, remains *in statu quo* for a few days, and then subsides, the inflammatory symptoms disappearing rapidly, while the swelling is absorbed very slowly.

The course just described presents numerous variations.

In the first place the onset of epididymitis may be very violent.

The patient, who is suffering from acute urethritis, exposes himself to some injury, and at the end of twelve to twenty-four hours is attacked, towards evening, by violent pains which cannot be localized accurately and involve the entire abdomen. The lower part of the abdomen is tympanitic, tense, and extremely sensitive to touch, even to the pressure of the bedclothes. There is high fever, reaching to 39.5° C or even 40° C. The pains increase from hour to hour, radiate into the sacral

region and thighs; eructations, singultus, nausea set in, finally vomiting of greenish bile-stained mucus, and collapse. The symptoms create the impression of foudroyant peritonitis, and internal incarceration is suspected. Acute delirium tremens may occur in drinkers. On the following morning, when the symptoms have subsided, the swelling of the epididymis is apparent. Unlike these acute prodromal symptoms, the epididymitis which supervenes is not always very acute, but may be confined to the epididymis or a portion of it. In these cases we evidently have to deal with symptoms of violent peritoneal irritation. Hunter was the first to direct attention to them.

We have stated that the disease begins in the epididymis, whence it extends upwards to the vas deferens and prostate. In rare cases the process is reversed, the disease pursues a descending course. After vesical tenesmus and cessation of the secretion a partial swelling of the prostate occurs, confined to one lobe. The vas deferens, swollen to the size of a raven's quill, can soon be felt to one side, and it is not until three or four days later that a circumscribed and moderately painful swelling of the epididymis develops. This may increase to an acute extensive epididymitis as the result of external causes. In a few cases I have been able to confirm Bergh's observations on this point.

The blenorrhagic inflammation may even be confined to the vas deferens, constituting pure chordonitis blenorrhagica. J. Bell (1794) was the first who observed a few cases of this kind. In one of these, which was carefully described, the patient, whose gonorrhœal secretion suddenly ceased, began to complain of violent pain at the neck of the bladder, extending towards the inguinal region and the testicle. A tumor suddenly developed below the inguinal ring, at first as thick as a raven's quill, and could be traced as far as the epididymis. The latter as well as the testicle was unaffected. The tumor rapidly increased in thickness until it was an inch in diameter, had an elongated, round, almost spindle shape, and extended to the upper part of the testicle. Gosselin reports another case. In a man of twenty-five years, who had suffered from blenorrhœa for five months, a swelling formed in the scrotum at the level of the head of the epididymis. It formed a nodule as large as a hazel nut, terminating above in a cord as thick as a raven's quill, and could be separated from the epididymis.

Rectal examination showed nothing abnormal. Bergh describes a similar case. Kohn's patient, a servant suffering from urethritis, suddenly experienced pain in the right side of the scrotum after a paroxysm of coughing. This increased, and fever, constipation and vomiting were superadded. A cylindrical tumor developed in the right inguinal region, beginning at the external inguinal ring, passing into the right half of the scrotum without sharply defined boundary, and corresponding to the course of the right spermatic cord. The right testis and epididymis appeared intact. The vas deferens, normal below, passes into the tumor, the skin over it is tightly stretched, and its temperature is elevated. Pain in the tumor spontaneously, and on pressure and coughing. The tumor gradually disappeared, leaving a cord as thick as catgut which was recognized as the spermatic cord.

An equally rare form is disease of a vas aberrans. Gosselin describes the case of a young man in whom, during the third week of an acute urethritis, a painful tumor developed in the scrotum, as large as a hazel nut and completely free; its pedicle could be followed to the neighborhood of the epididymis and the origin of the vas deferens.

Further varieties are created by changes in the position of the testis and epididymis.

These may occur within the scrotum, the mutual relation of the testis and epididymis being changed by rotation around the horizontal and vertical axes. Royet distinguishes five forms:

1. The epididymis is situated in front of the testis.
2. It is on the outer or inner side of the testis.
3. The testis is rotated around a horizontal axis, passing from right to left, and the epididymis is situated above the testis.
4. Under the same conditions the epididymis may be situated below the testis.
5. The position of the two organs is subject to constant change.

During a great part of fœtal life the testicle remains in the abdominal cavity and descends through the inguinal canal into the scrotum at a late period. Now, it may happen that the testicle remains in the inguinal canal, or it may go too far and pass into the perineum, where it remains on one side of

the raphe, or finally it may emerge through the femoral ring and remain fixed beneath Poupart's ligament. A testicle situated in such an abnormal position may be attacked during the course of a blenorrhagic inflammation.

The most frequent form is intrainguinal epididymitis. MM. Robert, Paris and Bouchard have described cases of this kind. In mild cases the patient complains of pain in the groin, and a painful swelling, covered by reddened skin, appears there, but rapidly subsides after rest and antiphlogosis. In severer cases the tumor is as large as a hen's egg or goose egg, with the long diameter parallel to Poupart's ligament. It consists of two distinct parts, one of which is semilunar in shape, situated to the outside and below, firm; the other part is situated above and within, is oval and elastic, creating almost the impression of fluctuation. If the spermatic cord forms a loop which dips into the scrotum, it is swollen and tender. The inflammation may also extend to the tunica vaginalis, serous effusion forms and presents distinct fluctuation. When the tunica vaginalis communicates with the abdominal cavity circumscribed or general peritonitis may develop. On examination of the corresponding half of the scrotum the testicle is found to be absent, and the patient not infrequently tells us that there had formerly been an oval swelling in the groin. This variety, like subcrural epididymitis, is apt to be mistaken for a bubo, while perineal epididymitis may simulate Cowperitis or a periurethral abscess. Examination of the scrotum and the demonstration of both testicles or the absence of one, form the decisive diagnostic factor.

A further complication, which was carefully studied by Ledouble, is owing to the fact that the corresponding half of the scrotum contains a hernia or varicocele in addition to the testicle. The tail of the swollen epididymis is apt to adhere to the hernia so that the latter becomes irreducible, and the inflammation may also extend to the peritoneum of the protruding gut, giving rise to symptoms of incarceration and peritonitis.

The inflamed epididymis may also become adherent to a varicocele, causing an exacerbation of the latter.

Finally, epididymitis may also be complicated by peritonitis, which usually remains circumscribed. According to Horwitz (1892), who studied this question exhaustively, the peritonitis

may develop: 1. As the continuation of an inflammation of the vessels of the spermatic plexus to the peritoneal coat of the spermatic cord in the pelvis. 2. By inflammation of the terminal ampulla of the vas deferens, which extends to the adjacent Douglas' fold of the peritoneum. 3. By inflammation of the lymphatic gland on the internal iliac vein, which receives the lymphatics from the vas deferens. A painful circumscribed tumor then forms in the pelvis above Poupart's ligament and in the region of the posterior inferior spinous process. A case of this kind has come under my observation.

The most favorable termination of epididymitis is recovery. Although this takes place in the majority of cases, complete *restitutio ad integrum* is a comparatively rare event.

It is true that the inflammatory symptoms disappear and the swelling diminishes, but the absorption of the infiltration is incomplete. In some portion of the epididymis, usually the head, a nodule remains, as large as a pea or even larger, firm, sharply defined, and causing little annoyance to the patient.

New injuries occurring during the course of the urethritis may be followed by a relapse starting from this nodule, but finally the process remains stationary.

In other cases a diffuse uniform thickening of the head or tail of the epididymis remains, and testifies for years to the process which has run its course.

These residua of epididymitis may remain in any part in which the acute inflammation has been seated. In the vas deferens this is shown by the persistence of a firm, painful cord, in the tunica vaginalis by the fact that only a part of the acute exudation is absorbed while the rest remains in the form of chronic hydrocele.

A rarer and, naturally, much more serious termination is suppuration. Starting from the height of the process, which is then extensive and associated with acute hydrocele and eczema glabrum, one or more abscesses develop, attended with fever and violent pain. The abscesses cause bulging of the skin, finally rupture, and discharge crumbly pus. This is attended usually with the evacuation of a yellowish, bunched mass, which appears to consist of separate threads. When these threads are pulled upon, they may be drawn out to a considerable length. This is the coil of the tubules of the epididymis. If only one abscess forms and then heals—this is at-

tended usually by funnel-shaped retraction of the skin—a portion of the epididymis and testis may remain intact. But if several abscesses form, the entire contents of one half of the scrotum are usually destroyed by purulent degeneration and elimination.

In other cases the process assumes a chronic course after perforation externally has occurred. The perforations are then converted into fistulous openings which discharge small amounts of crumbly pus, but the destruction continues for a very long time. In this way a large part of the testicle and epididymis is eliminated. The integument of the scrotum usually becomes thickened by chronic inflammation, its folds become very prominent, and hidden between them are the fistulous openings, which are often retracted into a funnel shape.

Finally, in tuberculous and syphilitic individuals blenorrhagic epididymitis may furnish the starting-point for the development of corresponding tuberculous and syphilitic changes.

The course of bilateral epididymitis, which is a rare disease, is exactly like that of the unilateral affection. The inflammation rarely develops at the same time on both sides, but usually begins in one testicle while the other is recovering. It happens not infrequently that after recovery of the former the one first affected is again attacked.

An important question refers to the seminal changes resulting from disease of the organs which produce and convey the semen. These can be better studied in bilateral epididymitis, because in unilateral disease the other side produces normal semen.

In the acute stage, during which pollutions are not uncommon, the semen is found to have a yellow or yellowish-green color from the beginning of the inflammation, and leaves stains upon the clothing which have the central gray color of normal semen, while there is a yellow ring, like pus, at the periphery. In addition to the ordinary cellular elements of the semen microscopical examination shows multinuclear pus corpuscles in larger or smaller numbers. In unilateral epididymitis spermatozoa are usually present in large numbers, living and well developed, in bilateral epididymitis they are generally absent from the second or third day of the disease. In the acute stage, after the urethral suppuration has ceased entirely and

the urine is clear, the pus which is mixed with the semen cannot come from the urinary passages—as may be seen in pollutions during the acute stage of a simple anterior urethritis—but must be derived from the seminal passages. Fuerbringer states that the pus is due to catarrh of these parts. As the acute symptoms disappear, the amount of pus in the semen diminishes, the latter often becomes peculiarly thin, and the spermatozoa often remain absent for several months. This is usually associated with diminution of sexual desire. The spermatozoa finally return.

More important, because often permanent, are the changes induced by the infiltrations and thickenings which are left over. These thickenings, consisting of connective tissue which grows constantly firmer, enclose the excretory canals, and may thus prevent the passage of semen from the testicle. Gosselin's injection experiments have shown that this compression of the ducts of the epididymis is very often complete, but not infrequently consists merely of narrowing of the canals. If a fibrous nodule is situated in the head of the epididymis it is relatively innocuous, because sufficient semen can escape through the middle portion and tail. When it is situated in the tail the conditions are much more unfavorable, the interference is more marked, perhaps even complete.

If one epididymis alone is diseased, the other performs its function regularly, indeed it might be expected to act vicariously. But this does not happen in all cases. At least Jullien states that in the acute stage of certain unilateral epididymitides, when the other testicle and epididymis appeared to be entirely normal, he found complete absence of spermatozoa, and that after the disappearance of the inflammatory symptoms he has observed marked oligaspermia, which often lasted a long time.

In 85 cases of bilateral epididymitis, followed by indurations, Gosselin, Godard, Liégeois and Jullien found only 9 in which the spermatozoa returned, in the other 76 cases aspermatism remained. It is questionable whether this is permanent. At least Horand reports concerning several individuals who, although suffering from old bilateral indurations, became fathers of a numerous progeny. Gosselin made the interesting observation in these cases of aspermatism that the semen retains its external characteristics, consistence, amount, odor,—

facts which are explained by Fuerbringer's investigations on the composition of the semen.

Unilateral suppuration of the testicle does not interfere permanently with the function of the other testicle; the potentia generandi and cœundi is retained. Bilateral suppuration causes impotentia generandi. The ability to perform coitus need not suffer, as is shown by Bjoerken's case. A man, æt. twenty-three years, who lost both testicles in rapid succession from suppurating epididymitis, performed coitus and had pollutions after recovery. The ejaculation did not contain spermatozoa.

Pathological Anatomy.

While the relative frequency of this complication and its serious significance were the cause of our early knowledge of this condition, it also led, on the other hand, to frequent opportunities for anatomical examinations.

Nevertheless one error was carried down to the beginning of the present century, to which the disease owes its popular name of "swelled testicle." The site of the disease was located in the testicle, and the affection was called blenorrhagic orchitis. So far as I know, Monteggia (1804) was the first to make an autopsy in a case of epididymitis, and noted that the testicle was unaffected. He gives the following description: "The tunica vaginalis was adherent to the albuginea, and a yellow purulent fluid was found below between the inflamed and thickened membranes. These membranes were more adherent than in the normal condition. The membranes of the dartos were also hard, thickened and inflamed. The testicle itself was normal and not in the least thickened. In that portion of the tunica vaginalis which is usually prolonged behind the epididymis, was found a cavity containing a soft yellow substance, which was probably derived from exuded inflammatory lymph. The entire prostate had undergone suppuration and was separated into different divisions by a number of pus cavities. These abscesses opened into the urethra in three places; twice at the sides of the caput gallinaginis, and also further back towards the neck of the bladder. The pus had also pushed back the capsule of the prostate and formed a large pus cavity between the neck of the bladder and the rectum."

Gaussaille published the reports of two autopsies. In the first the epididymis was twice its normal size, firm and hard. The testicle also appeared to be doubled in size, but this was found, on section, to be due to an accumulation of thick, cloudy, slightly bloody serum between the layers of the tunica vaginalis testis. The albuginea was thickened, and traversed by dendritic vessels. The substance of the testicle showed no notable changes.

In the second case both vesiculæ seminales were swollen and firm, and the vasa deferentia also showed traces of inflammation. The epididymes were enlarged on both sides and of a wine red color, the testicles were normal in size; a small amount of fluid in the tunica vaginalis.

Based on these investigations and on their observations in the living, Rochoux and Ricord declared: "Pas d'affection blenorrhagique des organes contenus dans les bourses sans engorgement de l'épididyme," and the truth of this statement is generally recognized at the present time.

Velpeau made an autopsy on a man of twenty-two years who died of cholera, and had suffered for eighteen days from epididymitis. He found the tunica vaginalis, testicle, and the head and body of the epididymis, normal. In the tail was a nodule as large as a bean, which was yellow on section. The last convolutions of the vas deferens and epididymis appeared dilated, and contained pus. No spermatozoa were found in the vas deferens and corresponding seminal vesicle.

In cases of intrainguinal epididymitis Paris found the tunica vaginalis adherent to the testicle and covered with false membranes, the testicle apparently normal, but without seminal elements, and usually atrophic. In Gosselin's case the testicle was in the inguinal canal, the epididymis had descended into the scrotum, was considerably swollen, and infiltrated with foci of pus.

In two cases Godard found the seminal vesicle on the diseased side smaller than on the other, and there were no spermatozoa in the vas deferens, while they were abundant on the healthy side.

Schepelern reports an interesting case. A sailor, æt. seventeen years, who had suffered for three weeks from blenorrhœa, and for eight days from left epididymitis, was suddenly attacked by right-sided peritoneal symptoms and died in thirty-six hours.

The autopsy showed that the cause of death was typhlitis, perforation of the vermiform appendix and peritonitis.

The urethra was reddened, especially in the most posterior portion. The entire left vas deferens was half again as thick as the right, its vessels were injected and tortuous, the cauda of the left epididymis was swollen, infiltrated, firmly fibrous, and the anterior portion contained a collection of pus as large as a pea. The remainder of the epididymis was somewhat enlarged, the testicle was normal. In the tunica vaginalis was a small quantity of fluid, and beginning adhesive inflammation corresponding to the cauda. The tunica propria was thickened, and adherent to the lower part of the scrotum. Microscopic examination showed slight catarrh of the vas deferens.

Finally, we owe to Rougon the history of the following interesting case. An artillery officer, æt. thirty-five years, is brought to the hospital in a dying condition. The skin is cold and clammy, the face pinched, the pulse rapid, small and thready; pain in the head, thirst, nausea, vomiting of bile. The abdomen tense and painful, especially in the region of the right iliac fossa. Right-sided epididymitis with acute hydrocele of the tunica vaginalis. The autopsy showed: the abdomen distended with gas, ecchymoses in subperitoneal cellular tissue on right side. Peritoneum covered with false membranes, especially in the right iliac fossa; about 300 grm. sero-purulent fluid in the iliac fossa and pelvis, 100 gr. sero-purulent fluid in the right tunica vaginalis propria testis, the membrane injected, and covered here and there with false membranes. The right epididymis swollen, reddened, ecchymotic, containing spots of pus on section. The right spermatic cord thickened, with exudation in its coverings.

The almost complete picture of epididymitis furnished by these autopsies is supplemented by the investigations of Malassez and Terillon. In beginning epididymitis they found the epithelium of the seminal canals in a condition of cloudy swelling and destitute of cilia, the remaining tissues normal. A higher grade is characterized by œdema of the walls with small cell infiltration. In still more advanced stages the loose tissue around the seminal canals is infiltrated and swollen, the canals themselves are filled with a yellowish-green fluid, consisting of semen and pus. The nodules of the advanced stages are formed of densely infiltrated connective tissue surrounding the seminal canals.

Diagnosis, Prognosis.

The symptomatology is so characteristic that there can hardly be any doubt concerning the nature of the affection in the majority of cases. In cases of abnormal position the knowledge of this fact, together with examination of the scrotum, which should never be neglected, as regards the presence of both testicles, suffice for the diagnosis.

The prognosis is favorable in the majority of cases. The possibility of suppuration or peritonitis should make us cautious in giving a prognosis in feeble, cachectic individuals, or when the inflammatory phenomena are very severe.

Treatment.

Unlike the changing principles of treatment of gonorrhœa and its complications, the treatment of epididymitis has remained tolerably stable. The methods varied only between the limits of antiphlogistic treatment. The first thought would be to diminish the swelling or prevent its increase by exercising external compression, and so this plan was adopted after that of abstraction of blood, which was so prevalent at the beginning of the century. The oldest of these methods is that of Fricke, who performed compression by means of strips of adhesive plaster. The testicle and epididymis of the diseased side were first grasped separately in the corresponding half of the scrotum and prevented from slipping by an encircling strip which compressed the scrotum immediately above them. Then follows a series of vertical strips, about the width of the finger and overlapping like shingles, which cross at the lower extremity of the scrotum, and thus form a firmly adherent cap. These are secured by one or more encircling strips. Employed originally in recent epididymitis, this method, which is still used occasionally, is confined generally to the second stage when the inflammatory symptoms have disappeared and the swelling alone remains. This dressing aids resorption materially, but it possesses the disadvantage that, when applied too tightly, it produces pain or causes atrophy of the testicle, and when applied loosely, has little effect and must be frequently changed. This is painful, because the dressing adheres firmly to the hairs on the scrotum.

White's dressing is a modification of Fricke's. Miliano's compressing suspensory (Fig. 35) acts in a similar manner, though not so brusquely. It consists of a knitted sac, fitting one half the scrotum, provided with straps, the tightening of which enables us to produce moderate compression of the testicle and epididymis.

A series of applications to the scrotum also produce compression. These are usually of an irritating or caustic nature,

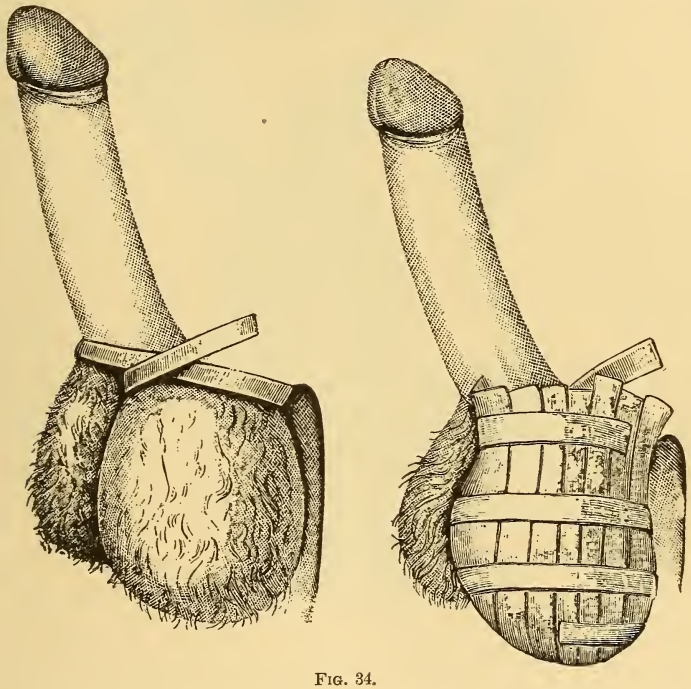


Fig. 34.

and cause compression by means of reflex contraction of the tunica dartos. These include the application of nitric acid, collodion, concentrated solutions of nitrate of silver (1:20), sulphuric ether, and tincture of iodine.

The diminution of the tension was also regarded as antiphlogistic, especially in those cases in which fluid had accumulated in the tunica vaginalis. Velpeau recommended puncture of the tunica vaginalis with a bistoury for this purpose. This is a harmless method, which usually produces immediate relief, but is followed unfortunately by a fresh accumulation of fluid.

Vidal recommended a more vigorous plan, *viz.*, debridement, or splitting of the coverings of the testicle down to the tunica vaginalis over an extent of 1.5 to 2.0 cm. This treatment was abandoned after several cases were reported in which it had been followed by suppuration, gangrene, and elimination of the testicle. In recent times Smith, Ragazzoni,

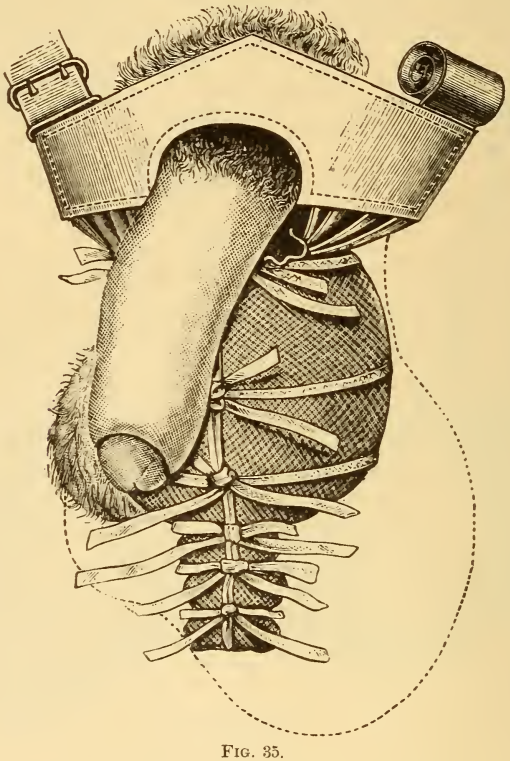


Fig. 35.

Appiani, and Nunn have again recommended punctures, partly simple, partly extending to the tunica vaginalis. Jobert injects several drops of tincture of iodine into the tunica vaginalis.

Watson Spencer follows puncture with an adhesive-plaster dressing. Bonnière scarifies, applies ice compresses and, when the integument of the scrotum has contracted, a knitted, snugly fitting suspensory, which is smeared with rapidly drying glue in order to make it more resisting.

Cold has also been applied locally in the shape of cold compresses and ice. This is an extremely vigorous antiphlogistic, but the continued application of ice gives rise to extremely firm infiltrations, which then resist absorbent treatment for a long time.

All these cumbersome apparatus are generally abandoned at the present time. The conviction has been reached that epididymitis runs a favorable course spontaneously, and that in the majority of cases it is merely the duty of the physician to keep hurtful factors at a distance. Rest in bed, and an elevated, guarded position of the scrotum by placing beneath it a compress or handkerchief, suffice to diminish the pains and secure a favorable termination. Regular evacuations from the bowels and fever diet will do the rest. The pollutions are treated in the usual way. Frequently changed compresses of cold water are useful, but ice compresses must not be employed. If we are anxious to do something more, unguentum cinereum with extr. belladonna (1:25) may be applied externally. Under this treatment the inflammatory symptoms disappear in four to five days.

Few patients are able to remain in bed during the inflammatory stage of epididymitis, as this is rendered impossible by the necessary secrecy. The application of Horand-Langlebert's suspensory (Fig. 36) then offers an admirable substitute for the, in great part, expectant plan of treatment just described. This consists of a thick layer of cotton, in which the entire scrotum is carefully enclosed; over this comes a piece of rubber cloth suitably cut out, and then a wide linen suspensory, like the ordinary varieties, except that it possesses two lateral gores which are closed by bands. This permits better fitting of the suspensory, especially to the perineum, and enables us to cover the scrotum completely. This apparatus protects the epididymis from external injuries, fixes it and keeps a uniform warm temperature, conditions which correspond to those of rest in bed.

In fact this suspensory has an admirable effect. Patients who could hardly walk on account of the violent pains, experience decided relief immediately after its application and can usually attend to business at once. It is only in cases of considerable swelling of the spermatic cord that the suspensory is not well borne. If it is well borne, it should be worn

constantly for several days, the cotton being renewed every twenty-four hours. The bands, which are drawn as tightly as possible during the day, are loosened at night.

Under this plan the inflammatory symptoms also disappear in four or five days, and a second important indication must then be fulfilled, *viz.*, the absorption of the infiltration. Moist heat, and iodine internally and externally, give good results. Those patients who have worn Langlebert's suspensory continue its use, those who have remained in bed

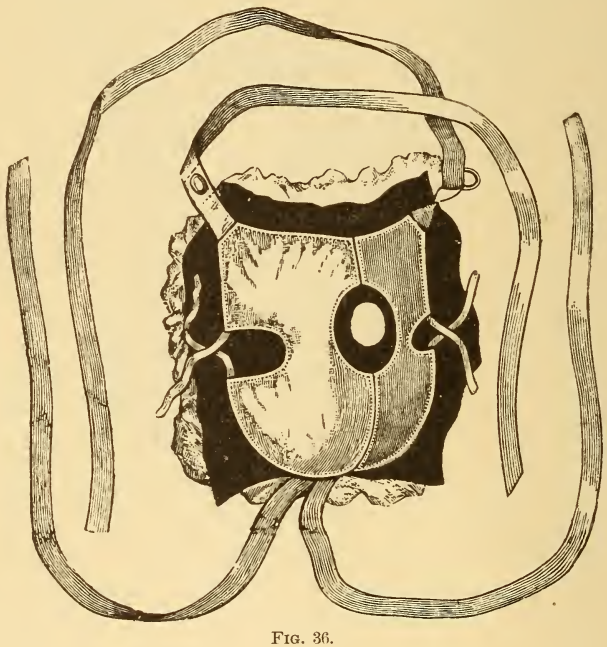


Fig. 36.

wear this or some other wide and comfortable suspensory, which will contain the necessary dressings. We recommend a dressing of moist linen, folded three or four times, over this a piece of parchment or gutta-percha paper, projecting slightly beyond the edges of the linen, and then a tolerably thick layer of cotton. The suspensory is then applied over the cotton. The linen is moistened two or three times a day. If the patient has already worn a Langlebert's suspensory, the form of dressing may be changed as soon as the pain disappears. When the inflammatory symptoms have been treated with cold, it is

well to allow an interval of twenty-four hours between the change from cold to warmth, or the change may be made gradually by allowing the cold compresses to remain until they begin to grow warm, as soon as the inflammation subsides. Unless some injury intervenes (coitus, excessive exercise, pollutions, etc.), this treatment causes rapid and thorough removal of the infiltration. If the infiltration is old and firm iodine may be used. The following ointment is rubbed in beneath the damp linen on the diseased side:

℞	Potass. iodid., ...	gr. xxx.
	Iodin. p., ...	gr. iij.
	Lanolin., ...	ʒ v.
	Ol. olivar., ...	ʒ ss.

This is used twice a day, and gr. xv.–xxx. of potassium iodide are given internally *pro die*. Unfortunately this treatment can only be adopted intermittently on account of the eczema which usually develops on the scrotum; when the skin itches and reddens, rice powder must be applied at once. Very old infiltrations and nodules, even if they have lasted for years, usually are absorbed, at least in part, when treated in this way.

Inasmuch as epididymitis is the result of a posterior urethritis, the latter must always be subjected to treatment after the recovery of the former. This may be done even while the painless infiltration is being treated in the manner described above. But the acute inflammatory symptoms must have disappeared for several days, as they are apt to return on premature beginning of treatment.

I can especially recommend Diday's irrigation of the pars posterior as the mildest method.

After the recovery of the epididymitis it is wrong to treat the blenorrhœa, which usually returns, with the gonorrhœal syringe. We have already spoken of its uselessness in posterior urethritis. On the other hand I could never convince myself of the spontaneous recovery of posterior urethritis in these cases, but am satisfied that severe symptoms follow if it is neglected and allowed to pass into the chronic stage.

VI. INFLAMMATION OF THE SEMINAL VESICLES.

Our knowledge of this rare complication of clap is very defective, so that I must content myself with its aphoristic description.

1. Acute spermatocystitis, according to Pitha, usually attacks one, more rarely both seminal vesicles at the same time. Rectal examination shows on the corresponding side of the posterior wall of the bladder, immediately over the prostate, a pear-shaped, firm or fluctuating swelling, which is much larger than the normal seminal vesicle, is painful and warm.

The symptoms consist of dull pressure in the rectum, which radiates towards the sacrum and bladder, and is notably increased on defecation, while micturition is usually undisturbed, though sometimes painful. There is usually violent sexual excitement, manifested by priapistic erections. Pollutions are very frequent, but are accompanied by violent burning pains, especially at the moment of ejaculation, instead of a feeling of pleasure. The ejaculated fluid has a yellow, red or brownish-red color, and leaves stains on the clothing, which are gray in the centre and surrounded by a yellow and brownish-red ring. The microscope shows blood, pus, and either no spermatozoa or dead ones. The patients are usually very depressed or irritable and anxious; this is partly due to the priapistic painful erections and frequent pollutions. The blenorrhagic discharge either ceases or it is abundant. In the latter event it contains spermatozoa. There may be high fever for a long time. Suppuration of the seminal vesicles, with discharge of the pus into the intestines and recovery, and into the peritoneal cavity with fatal termination, has been observed. On passing into the chronic stage the inflammatory and painful symptoms disappear, but the pollutions may continue, the semen constantly growing thinner and more albuminoid. As in spermatorrhœa, defecation causes the discharge of thick, lumpy, paste-like masses.

2. Chronic spermatocystitis develops in part from the acute form, in part directly as a complication of chronic urethritis.

Its symptoms are very obscure. Humphrey noted violent irritative symptoms on the part of the bladder, and incontinence. In one case I found that both seminal vesicles could

be felt *per anum* as firm, indurated, pyriform, painless nodules; despite continence there were extremely few pollutions, the product of which was pus and mucus corpuscles, with a few dead spermatozoa. In another case the very frequent and painless pollutions ejaculated a chocolate-brown mass, the color of which was due to decomposed blood; it contained pus and mucus corpuscles but no spermatozoa.

Post-mortem examinations are very scanty. Gaussaille and Hardy found, in acute vesiculitis, that the seminal vesicles were dilated by a thick, whitish-yellow mass, consisting of semen and pus; the lining membrane of the vesicles was injected, their walls firm. In chronic cases Lallemand and Humphrey found the ducts of the seminal vesicle dilated, the walls thickened, even cartilaginous or bony.

On account of the rarity of the disease the treatment is very meagre. A plan like that adopted in prostatitis may be recommended. In two cases of chronic vesiculitis I have obtained good results from my apparatus, which I mentioned in discussing the treatment of prostatitis, in conjunction with the previously mentioned potassium iodide-iodine suppositories.

VII. INFLAMMATION OF THE BLADDER.

General Remarks.

Cystitis was formerly regarded as one of the most frequent complications of urethral gonorrhœa, and this opinion has been held even in recent times. The latest investigations, however, have materially modified this opinion. The diagnosis of blenorrhagic cystitis is often made at the present time, but usually without justification. Under this diagnosis are usually included three processes, whose accurate differentiation we have learned very recently. These are:

Acute posterior urethritis,—i.e., inflammation of the membranous and prostatic portions, which terminates at the internal prostatic sphincter and leaves the bladder intact.

Cystitis,—either a total or partial inflammation of the vesical mucous membrane; it may be localized in different parts, but is usually situated either at the internal orifice of the urethra or the fundus of the bladder.

Acute posterior urethritis with partial inflammation of the bladder, around the internal orifice of the urethra and at the trigonum Lieutaudii.

Pure and uncomplicated posterior urethritis is the most frequent of these three varieties. Next in frequency comes the last-mentioned form, in which the process extends from the pars posterior to the adjoining mucous membrane of the bladder, to the vicinity of the internal orifice of the urethra. This is generally described as "cystite du col," or catarrh of the neck of the bladder, but I would discard the term "neck of the bladder," as it has no anatomical foundation. If by this term we mean only the pars posterior, the expression may be more precise but is superfluous. If the term is also meant to include the adjacent part of the bladder, it becomes vague. In the empty as well as the moderately full condition the bladder really has no neck, and is separated sharply from the urethra by the internal prostatic muscle. It is only in excessive distention of the bladder, *i.e.*, when it is really no longer in a normal condition, that a neck is formed, a reserve reservoir for urine in the posterior portion of the urethra. But this furnishes no reason for an anatomical description of the normal bladder based on a condition which is temporary and is always associated with discomfort. I will therefore eschew the term neck of the bladder, and propose the term posterior urethro-cystitis for this form of disease. Finally, the rarest cases are those of pure cystitis. It usually develops from a posterior urethro-cystitis, very rarely directly, inasmuch as the initial symptoms of posterior urethritis disappear rapidly or are barely marked.

With regard to the etiology of the cystitis, it is questionable whether it constitutes a direct blenorrhagic affection or is to be regarded as a mixed infection, due to the intervention of other irritants. Bumm maintains that every cystitis in the female is produced by a mixed infection, and this is also very plausible with regard to males. The urine of the bladder, in every case of cystitis, contains numbers of cocci and bacteria, while a large number of gonococci, from which we might infer proliferation in the bladder, cannot be demonstrated. The gonococci, if present at all, are always found in small numbers.

In a case of blenorrhagic cystitis in which an autopsy was obtained, Du Mesnil (1891) was unable to find gonococci in the secretion or upon the surface of the vesical mucous membrane. He also proved that gonococci do not decompose urea, so that alkaline and ammoniacal cystitides, which complicate blenorrhœa, cannot be due to this coccus.

Symptomatology.

Posterior Urethro-cystitis.—The symptoms are a mixture of those of posterior urethritis and cystitis. As a rule, the subjective symptoms are due to the former, while the latter is manifested by objective symptoms alone. With regard to the subjective symptoms I may refer to the article on posterior urethritis. There is usually tenesmus, almost constant in acute cases, while in subacute cases it is only imperative when the bladder is full. In addition there are radiating pains along the urethra, burning and tenesmus after micturition. In the subacute cases is also found another symptom to which I was the first (1880) to call attention. This is the variation in the tenesmus according to the position of the patient. So long as he stands and walks the tenesmus is more frequent and imperative than when the recumbent position is assumed. In the erect position the urine accumulates upon the inflamed portions of the vesical orifice and surrounding parts, which it irritates by its weight and thus increases the tenesmus, while in the recumbent position the bladder sinks down and the urine is received in the fundus.

Among the objective symptoms the discharge of blood with the last drops of urine is dependent on the acute posterior urethritis.

In the test of the two beakers the urine is found cloudy in both. But there are some material differences from simple posterior urethritis. In acute posterior urethritis the second urine, although cloudy, is always clearer than the first, and second clear portions alternate with cloudy ones. We have already explained the reason of this phenomenon.

In acute posterior urethro-cystitis the cloudiness of the urine in the bladder is the result of two factors, *viz.*, the muco-pus which enters the bladder from the pars posterior, and then the muco-pus which is formed in the bladder by the catarrhal mucous membrane. It therefore follows that:

Inasmuch as the cloudiness is produced in the bladder itself, a second clear urine is never observed.

In posterior urethritis the cloudiness of the first urine is caused by the pus in the urethra, while the second urine is cloudy from the excess of pus which has passed from the pars posterior into the bladder. In urethro-cystitis the urine is

clouded in the bladder by the pus and mucus produced there. In the latter disease, therefore, the cloudiness of the urine in both vessels is more pronounced, the difference between both portions is not considerable, because the muco-pus will be precipitated in the bladder and will escape with the last urine.

If a patient with acute posterior urethro-cystitis is allowed to urinate in three portions, the first will be very cloudy from the excess of muco-pus in the urethra; the second is less cloudy, containing the upper layers of urine from the bladder which flow through a clean urethra; the third portion is again more cloudy, because it washes away the muco-pus produced in the bladder and which has been partly precipitated. Some patients notice that with or after the last drops of urine pure pus escapes from the urethra in a few drops or a short stream.

If this urine is allowed to precipitate in two or three portions, we usually find the two well-known layers, a lower, rapidly precipitating, crumbly layer of pus: an upper, loose, slowly precipitating, cloudy or flocculent layer of mucus; above this clear urine. The relative proportions of both layers vary, whence we may distinguish a more mucous or more purulent catarrh.

The microscopical examination shows pus and mucus corpuscles, large flat epithelium of the bladder, and variously formed epithelial cells, which are derived partly from the lower layers of the bladder, partly from the urethra. In the first urine we often find quite numerous gonococci in the pus cells; in the second urine pus cells containing gonococci are scanty or absent, while there is often an abundance of other cocci and many short rods, not in cells.

Chemical examination constantly shows a small amount of albumin; when the tenesmus is violent it often persists as long as the latter, may become very considerable, and is produced by the tenesmus.

The reaction of the urine is usually acid, rarely alkaline. The latter reaction is generally due to hæmaturia. If the posterior urethritis is very acute, blood not alone appears with the last drops of urine, but the hemorrhage from the pars posterior, excited by the violent tenesmus, is abundant and protracted. The blood which escapes from the pars posterior in the intervals between micturition, enters the bladder and may neutralize the acid reaction of the urine accumulated there or make it alkaline.

In making the test of the three beakers the urine is then found bloody in all. In the third glass, the muco-pus, mixed with blood, appears as a tough, snotty mass which adheres to the vessel, and under the microscope shows variously shaped, in part destroyed, blood and pus corpuscles, epithelium and the well-known coffin-lid triple phosphate crystals. The urine is foul smelling and filled with micro-organisms. The amount of albumin is large, probably dependent on the presence of blood.

It is hardly to be supposed that in these cases the inflammation of the bladder is confined to the vicinity of the vesical orifice, but it probably affects the entire mucous membrane. In addition to the symptoms mentioned there is often violent pain over the symphysis, which increases on pressure, and slight paresis of the detrusors. The bladder, despite frequent micturition, remains half filled and can be felt above the symphysis. If the acute posterior urethritis subsides, the tenesmus and hæmaturia disappear, while the symptoms of acute purulent cystitis remain and not infrequently become chronic.

Acute Cystitis.—This is a rare complication of acute urethritis. It very rarely happens that an acute anterior urethritis extends unnoticed to the pars posterior and then gives rise to cystitis. The acuteness of the inflammatory symptoms on the part of the pars posterior almost always provokes, in such cases, an acute posterior urethro-cystitis. More frequent are cystitides resulting from subacute and chronic posterior urethritis, which extends to the bladder as the result of the well-known local or remote irritants. Cystitis also develops as the residuum of an acute urethro-cystitis when the symptoms of acute posterior urethritis have disappeared. In these cases the acute cystitis usually produces few subjective symptoms. General malaise, the result of slight fever, pain over the symphysis and moderate tenesmus are the only symptoms.

The test of the two or three beakers always shows most marked cloudiness of the second or third vessel, because this depends on the muco-pus produced in the bladder and which has been, in part, precipitated.

We may distinguish two grades of this disease:

Mucous, Catarrhal Cystitis.—The urine is acid, slightly cloudy, precipitates slowly. The sediment is flocculent, consists of numerous mucus corpuscles, large bladder epithelium and micro-organisms.

Purulent Cystitis.—The cloudiness of the urine is more marked, its reaction neutral or more frequently alkaline. The sediment is white and crumbly, and precipitates rapidly; or, if the reaction is alkaline, it is snotty and lumpy, yellow or greenish. The microscope shows numerous pus corpuscles and, if the reaction is alkaline, abundant coffin-lid crystals of the triple phophates. Numerous micro-organisms and bladder epithelium are always found. When the reaction is alkaline the urine is always very foul smelling. The amount of albumin is proportionate to that of pus.

Chronic Cystitis.—This develops very rarely directly from chronic posterior urethritis and prostatitis, more often it develops from acute cystitis. Here also we may distinguish mucous and purulent catarrh. The objective symptoms just mentioned become permanent and often contrast in a very striking manner with the absence of all subjective symptoms.

The causes of the spread of the inflammation to the bladder are the well-known intercurrent morbific agents which operate during the course of urethritis. Some of these are particularly adapted to the production of cystitis. Thus, excesses in venere or Baccho, during the course of acute posterior urethritis, give rise much more often, indeed almost without exception, to epididymitis. The development of urethro-cystitis or cystitis, on the other hand, is usually the result of direct local irritation, instrumental examination or strong injections. This fact favors the view that cystitis is the result of other irritants which have been introduced in this way, as was directly observed in Paillard's previously mentioned case.

As a rule, acute anterior urethritis is first followed by a posterior urethritis, and this by cystitis, or the anterior urethritis is followed directly by posterior urethro-cystitis, which remains in an acute or subacute stage for a few days, and then generally disappears rapidly.

But the symptoms of urethritis may disappear first, those of cystitis then predominate for some time, and finally these also recover. Finally, the cystitis may pass into a chronic stage. These are the most frequent terminations. A rarely observed termination is that of the spread of the inflammation to the other layers of the bladder, and the development of parenchymatous cystitis. This is always a dangerous disease. Ulceration of the bladder and perforation, with fatal

peritonitis, may set in, as in Gintrac's case. The inflammation may also spread outwards layer by layer without ulceration, extend to the peritoneum and be followed by purulent peritonitis and death, as in Gendrin's previously quoted case.

Finally, another rare eventuality is the extension of the inflammatory process to the renal pelvis and the kidney.

Diagnosis and Differential Diagnosis.

The diagnosis of posterior urethro-cystitis, acute and chronic cystitis, is evident from the symptomatology just described. Acute posterior urethritis must be differentiated from posterior urethro-cystitis and acute cystitis. A consideration of their individual symptoms, especially testing the urine in two or, if necessary, three vessels will usually enable us to make the diagnosis without difficulty. Nevertheless there are cases, generally of a subacute character, in which in addition to the symptoms of subacute posterior urethritis, there is uniform cloudiness of the urine in both vessels or even in all three, and it is not easily settled whether we have to deal with a pure posterior urethritis or an urethro-cystitis. If other methods of examination have given no sufficiently decided result, the following plan is recommended. A narrow elastic catheter is introduced into the bladder, the organ washed out with lukewarm water, and the catheter, which is kept closed, allowed to remain. At the end of an hour the urine accumulated in the bladder is discharged through the catheter. If this urine is clear the implication of the bladder in the inflammatory process is excluded.

I must also make mention of phosphaturia, which, to the superficial observer, presents a picture similar to that of cystitis. The fact that both processes are often confounded proves the routine manner of ordinary examinations, and that the diagnosis of cystitis is often made from mere cloudiness of the second urine. In order to avoid error we recommend Ultzmann's simple method, which is easily made at each examination. A test tube of the cloudy urine is slowly heated to the boiling point. If the cloudiness disappears, it consists of urates. If it becomes more pronounced, a few drops of acetic acid are added. If it then disappears, it consists of earthy phosphates; if unchanged, it is due to pus. Finally, if

the cloudiness remains unchanged on boiling and the addition of acetic acid, it is composed of pus or bacteria, and the distinction is shown under the microscope.

Pathological Anatomy.

The number of autopsies on blenorrhagic cystitis is small. The few known ones, such as those of Gendrin and Gintrac, disclosed very marked changes, which are not found in the majority of cases. Thus, in Gendrin's case, the bladder was smaller than normal, its walls rigid and thickened, its contents sanguino-purulent. The mucous membrane, considerably thickened, was covered with a thick layer of tough muco-pus, and showed several ulcerations of different sizes. The peritoneum, especially at the fundus of the bladder, had a wine-red color and was covered with firmly adherent membranes. In Murchinson's case the mucous membrane of the bladder was thickened, reddened and covered with pus.

Examination of the bladder with the endoscope, which I adopted in 1879 in association with Nitze, furnishes us clear data concerning the ordinary changes in the mild and more frequent cases. According to the severity and extent of the process the bladder is found more or less ridged *in toto* or in places, more or less reddened or traversed by dendritic vessels. The epithelium is lifted from its base, and loosened in shreds, which in part are still adherent to the mucous membrane by thin threads, in part float free in the urine, while the swollen follicles project as dark red points.

Burckhardt (1889) made an endoscopic study of the changes in posterior urethro-cystitis. In the usual, uncomplicated forms he finds the mucous membrane of the pars prostatica of a dark-red to bluish-red color, with a velvety or ridged condition of the surface. When the ridging is marked the radial stripes are not visible. The mucous membrane bleeds readily on contact with the tampon. The colliculus is usually swollen and dark in color. The mucous membrane in the vicinity of the internal orifice and extending to the trigonum has a very red color, but no vessels are distinctly visible. This diffuse redness rapidly gives place to the lighter normal color, without the intervention of a transition zone.

Prognosis.

As in all complications of blenorrhœa the prognosis should not be made absolutely favorable. In the first place, cases have been known, though rarely, to have a bad or even fatal termination, and, in the second place, all complications, including cystitis, have a tendency to pass into an obstinate chronic stage. Nor must it be forgotten that a complication creates a striking predisposition to its redevelopment on fresh infection, and that the obstinacy of the affection always increases on its recurrence.

Treatment.

The indications for treatment vary according to the intensity and acuteness of the process. In acute urethro-cystitis and cystitis the treatment is chiefly symptomatic and expectant. Regulation of hygienic and dietetic measures often suffices to effect rapid recovery of the affection. Above all rest in bed is necessary, and the patients readily yield to this instruction, inasmuch as cystitis is always regarded by them as a dangerous disease. In addition we order fever diet, and regulate the bowels. The following decoctions are ordered as drinks:

℞ Decoct. fol. uvæ ursi, ... ℥ xvj.
Syr. diacodi., ... ℥ ss.
S. One tablespoonful every two hours.

℞ Decoct. semin. lini., ... ℥ xvj.
Tinct. opii, ... gtt. xv.
Aq. laurocerasi, ... ʒ iiss.
S. One tablespoonful every hour.

℞ Herb. herniariæ,
Fol. uvæ ursi, ... āā ℥ j.
S. Made into a tea. One cupful morning and evening.

℞ Herb. herniar.,
Herb. chenopod. ambros., . . . āā ℥ j.
S. To be made into a tea.

If the hæmaturia is marked, styptics are given internally, for example:

℞ Ferri sesquichlorid. sol., ... gtt. xv.
Aq. destil., ... ℥ v.
Syr. amant. cort., ... ʒ vj.
S. One tablespoonful every hour.

Painful symptoms are treated with suppositories of extract of belladonna and morphine, or subcutaneous injections of morphine. Opium is to be avoided, as it is apt to produce constipation. Warm abdominal compresses are the simplest remedy in pain, tenesmus and dysuria; when these are more severe, morphine is indicated.

Causal treatment is only adopted after all irritative symptoms have disappeared and the objective symptoms still continue.

This treatment must first be internal.

The well-known balsams (oil of sandal wood, copaiba, turpentine), prescribed as in urethritis, often produce good effects and cause the urine to clear up rapidly. If they are not well tolerated or do not produce the desired effect, we may prescribe:

℞ Tannin, ... gr. xv.
Camphor ras., ... gr. iss.
Sacch. alb., ... ʒ ss.
Inf. pulv. Div. in dos. X.
S. Three powders daily.

℞ Extr. cannabis ind.,
Extr. hyoscyami, ... āā gr. v.
Sacch. alb. . . . . gr. lxxv.
M. f. pulv. Div. in dos. X.
S. Three to five powders daily.

℞ Acid benzoic, ... gr. lxxv.
Aq. destil., ... ℥ x.
Syr. cort. amant., ... ʒ vj.
S. One tablespoonful every two hours.

℞ Extr. cannabis ind., ... gr. v.
Sacch. alb., ... gr. lxxv.
M. f. pulv. Div. in dos. X.
S. Three to five powders daily.

℞ Soda salicyl., ... ʒ iiss.
M. f. pulv. Div. in dos. X.
S. Three powders daily (in wafers).

℞ Potass. chlorat., ... gr. xlv.–lxxv.
Aq. laurocer., ... ʒ ss.
Aq. destil., ... ℥ x.
S. To be taken in one day (caution!)

Alkaline waters are to be used cautiously. So long as the affection is a mild, mucous, catarrhal process, and the urine is distinctly acid, the waters of Preblau, Giesshuebl, Gleichenberg, and Wildungen often have rapid and good effects. But if the urine is feebly acid or alkaline, and there is a tendency to phosphaturia, these waters are directly contra-indicated. They increase the alkalinity of the urine and the phosphaturia and keep up the process, while it should always be our object to increase the acidity of the urine. The above-mentioned remedies, the balsams, tannin, salicylate of soda and benzoic acid are especially adapted to this purpose. But it often happens that, although the irritative symptoms disappear, these internal remedies do not prove successful. The urine remains cloudy and continues to contain pus and mucus. Local treatment is indicated in these cases. In addition to or apart from the internal treatment, we proceed to wash out the bladder with medicated solutions. These irrigations are best performed by first introducing an elastic, not too large catheter, into the moderately full bladder and evacuating the urine. We next inject, by means of a syringe, containing 6 to 10 ounces, one or two syringefuls of lukewarm water into the bladder, allow it to escape at once, and then one of the following solutions, after it has been warmed:

℞ Acid salicylic, ... gr. xv.
Aq. destil., ... ℥ vj.

℞ Resorcin, ... gr. xlv.–lxxv.
Aq. destil., ... ℥ iij.

℞ Quininæ sulph., ... gr. vij.
Aq. destil., ... ℥ xij.

℞ Potass. hypermang., ... gr. iss.
Aq. destil., ... ℥ vj.

℞ Acid boric, ... gr. xlv.
Aq. destil., ... ℥ vj.
℞ Argent. nitric, ... gr. vij.–xv.
Aq. destil., ... ℥ xv.

These solutions are allowed to remain in the bladder for three to five minutes, then removed and water injected, unless we prefer to allow the solution to remain in the organ.

In chronic cystitis tonic regimen is indicated, in addition to local and internal treatment. Many chronic cystitides, kept up by nutritive disturbances or cachexia, are only cured after recovery of the latter.

VIII. INFLAMMATION OF THE RENAL PELVIS AND KIDNEY.

This rare complication of acute urethritis is also the least known. The diagnosis of blenorrhagic pyelitis is made not infrequently, but usually improperly. If a patient with acute blenorrhœa suffers, in addition to violent tenesmus and the symptoms of acute urethro-cystitis, from pain in one or both loins, fever and perhaps chilliness, if the examination of the urine shows a larger amount of albumin than is accounted for by the amount of pus, pyelitis is commonly diagnosed. This diagnosis is erroneous. In cases of violent tenesmus the large amount of albumin results from this symptom, as can be very easily proven. If the tenesmus is ameliorated the amount of albumin diminishes at once and corresponds to the amount of pus, and increases at once with the increase in the tenesmus.

We must reserve the diagnosis for those cases in which the amount of albumin is larger than that of pus, apart from the tenesmus, and the microscope shows casts and epithelium of the straight urinary tubules in the sediment. Such cases occur and have been reported by Vidal, Rosenstein, Zeissl and myself. Murchinson performed an autopsy on a case of suppurative pyelo-nephritis. Fuerbringer (1890) observed several cases in which, after an attack of cystitis, chills and fever developed, with polyuria, pain and tenderness in the region of one kidney, vomiting and headache. The diagnosis was confirmed by the finding of casts of the renal pelvis. All the cases lasted only a few days and terminated spontaneously. In one case the cystitis and urethritis recovered with the pyelitis; but these cases are so rare and their origin so obscure that I must confine myself to these brief remarks.

CHAPTER V.

BLENORRHŒA IN THE FEMALE.

General Remarks.

As we know from the historical section of this work, blenorrhœa of the female has long been recognized, but the recognition of its true nature, mode of spread, and importance, is a late development.

This is the result of two factors. In the first place, the ignorance of the symptoms and localizations of subacute and chronic blenorrhœa, so that many women who suffered from blenorrhœa appeared to be healthy. Furthermore, catarrhs which are clinically indistinguishable from the blenorrhagic process may develop in women from other causes, such as fibroids, uterine polypi, etc. This circumstance led to the avirulistic theory, viz., that coitus with a healthy, *i.e.*, non-blenorrhagic female may give rise to clap under special circumstances.

The considerations previously mentioned, and particularly the fact that the most careful attention to Ricord's prescription does not produce clap in married life, led to the virulistic theory, to the conviction that the woman from whom a man acquired clap must also suffer from the same disease.

But this did not increase our knowledge of blenorrhagic diseases in women. I still remember when it was impossible for me to demonstrate a trace of blenorrhagia on examining a woman from whom a man was proven to have acquired acute gonorrhœa. Not alone could the diagnosis not be made in many cases, but the severity of the process in women was not recognized. The knowledge of the process was confined to the recognition of vaginitis, vulvitis, abscess of Bartholin's glands, and urethritis. The latter was regarded as very rare (five per cent. of all blenorrhagic females, Zeissl). Very bold syphilidologists ventured to speak of an "endometritis cervicalis blenorrhagica."

But as early as 1858 West had expressed the opinion that acute endometritis and metritis may develop in the train of blenorrhœa, and that the inflammation has a tendency to extend through the tubes to the peritoneum. Dobson, Nelson, and Giles (1871) also speak of peritonitis as the extension of the blenorrhagic process through the tubes to the peritoneum, Mulreany (1871) of acute gonorrhœal metritis which develops after menstruation or abortion in women suffering from blenorrhœa. But Noeggerath (1872) was the first to lay due weight on the importance of the blenorrhagic process in diseases of the uterus and its appendages. As Noeggerath himself admitted at a later period (1887), he adopted the too pessimistic standpoint that almost every gonorrhœa in the male passes into a stage of latency, despite apparent recovery, and that in this condition it may last for life and convey infection. This latent blenorrhœa in man was said to give rise to latent blenorrhœa in the female, manifested after a while by perimetritis and oöphoritis. Ninety per cent. of women who marry men that have suffered from blenorrhœa are said to be attacked in this way. The majority of these women (49 out of 81) are sterile. After describing 50 cases which illustrate the different forms of latent gonorrhœa in women—viz., 1, acute perimetritis; 2, recurrent perimetritis; 3, chronic perimetritis; 4, oöphoritis—Noeggerath comes to the following conclusions:

1. In man as well as in woman gonorrhœa persists despite its apparent cure.

2. There is a latent gonorrhœa in men and women.

3. Latent gonorrhœa in either sex may produce in a previously healthy individual of the opposite sex an infection which may run its course in an acute or latent manner.

4. Latent gonorrhœa in the female is manifested by perimetritis (acute, chronic, recurrent), oöphoritis, or catarrh of a circumscribed part of the genital mucous membrane.

5. The wives of men who have previously suffered from gonorrhœa are usually sterile, or they bear only one child, at the most three or four children.

At first Noeggerath's conclusions encountered only opposition. Williams (1876) described cases of blenorrhagic endometritis and oöphoritis. Fritsch (1876) stated that blenorrhagic vulvo-vaginitis was a local, easily curable disease.

Schroeder (1879) acknowledged that chronic inflammatory conditions of the female genitalia (vaginitis, endometritis, metritis, and perimetritis) are often caused by gonorrhœal infection, but he characterized Noeggerath's opinions as extravagant.

It was not until the discovery of the gonococcus that this question was cleared up and Noeggerath's opinions were found to be in the main correct.

The investigations which followed the discovery of the gonococcus threw light upon a number of obscure points.

I. The Frequency of Gonorrhœa in the Female.—Noeggerath believed that 80 per cent. of all married women suffered from latent gonorrhœa, but Oppenheimer (1884), who examined 108 pregnant women in Kehrer's clinic in Heidelberg, found gonococci in 30 (27.7 per cent.). Among 32 puerperal women Lomer (1885) found gonococci in 9 (28 per cent.). Schwarz (1886) examined 617 women; in 112 there was a strong suspicion of gonorrhœa, and this was confirmed in 77 cases (12.4 per cent.) by the finding of gonococci. Saenger (1889) found among 1,930 women gonorrhœal infection in 230 (12 per cent.), and he believes that one-eighth of all women who consult a gynecologist suffer from gonorrhœal infection.

II. The site of blenorrhœa in the female has also been explained by the gonococci investigations.

In 1846 Hardy reported a case of primary uterine blenorrhœa in a girl who, after coitus with a man suffering from clap, was attacked first by a purulent discharge from the uterus and only after a lapse of several days by a blenorrhœa of the vagina. Decourtieux (1880) called attention to the frequency of blenorrhagic urethritis, and Ducos (1880) discussed blenorrhagic metritis, salpingitis, and peritonitis. Boutin (1883) gave an excellent description of the clinical signs of localized chronic blenorrhœa in the female, and called attention to the fact that it may be localized, either in passing into the chronic stage or primarily, upon certain sites of predilection (follicles of the vulva, peri-urethral glands, Bartholin's glands, urethra, cervical canal). Nevertheless, it was the prevailing belief that vaginitis and vulvitis with complicating Bartholinitis were the principal forms of blenorrhagic disease.

Bumm (1884) was the first that regarded the cervical canal and not the vagina as the most frequent site of blenorrhœa.

Steinschneider (1887) stated that the urethra was affected in all recent cases. In 47 per cent. of all cases he found gonococci in the cervical canal, in 50 per cent. in the uterus. They may be found here after they have disappeared from the urethra. In the vulva and vagina the gonococci do not multiply or they are soon expelled by other cocci.

Among 38 female gonorrhœas which contained gonococci, Fabry (1888) found them 16 times in the urethra and cervix, 20 times in the urethra, and twice in the cervix alone. Wellander (1889) found the gonococcus in the urethra in 89 per cent. of the cases, in the cervical canal in only 43.7 per cent. Di Bella and Ingria, Aubert, Eraud, Horand, and Pescione also regard the urethra as the favorite site of the gonococcus. Bruenschke (1891) gives the following frequency of localization: in the urethra 90 per cent., in the cervix 37.5 per cent., in Bartholin's glands 12.5 per cent. Luczny (1891) collected 47 cases in Olshausen's clinic. Among these the gonorrhœa was located in the urethra in 40, the vulva in 12, Bartholin's glands in 17, the vagina in 19 cases.

Finally, I have reported 2 cases in which chronic gonorrhœa in the female was located exclusively in the urethra, the other external and internal genitalia being entirely intact.

III. The gravity of blenorrhagic disease in the female, its significance to the individual and to procreation.

It has been learned that as a rule the disease is not confined to the vulva, vagina, and urethra, but that it extends to the uterus, tubes, ovaries, and peritoneum. In fact, we now speak merely of acute and chronic gonorrhœa, because its extension over the greater part of the sexual organs is regarded as a matter of course.

1. The acute form develops from the conveyance of abundant purulent secretion, *i.e.*, from infection by a man suffering from acute blenorrhœa. It generally begins with the symptoms of acute vulvo-vaginitis and urethritis, a profuse purulent secretion which is apt to produce intertrigo, tenesmus, and burning during micturition. The clinical history may be complicated by acute suppurative Bartholinitis. The mucous membrane of the vulva, vagina, and urethra is intensely reddened and covered with abundant creamy pus. On extension to the uterus (acute metritis) fever develops, with violent pains in the pelvis and small of the back, enlargement and

tenderness of the uterus, sanguino-purulent to purulent secretion from the uterine cavity. Extensive exudations in the pelvis and around the tubes and ovaries are the result of circumscribed peri-parametritis and perisalpingitis, and the inflammation of the tubes may lead to foudroyant fatal peritonitis or to pyosalpinx.

2. The chronic form is due to infection by an old, latent, not thoroughly cured gonorrhæa. It is most frequent in newly married women whose husbands enter matrimony while suffering from chronic gonorrhœa. The majority of the husbands regard themselves as cured, but we may again call attention to the fact that the absence of a "good-morning drop" does not exclude blenorrhœa. The morning urine should always be examined and the absence of clap shreds demonstrated.

In typical cases the chronic form runs the following course: A young and previously healthy woman begins to complain soon after marriage. At first she notices merely an increased secretion from the genitalia, especially near the menstrual period. She is apt to suffer from burning and itching in the external genitalia. After a while a dull pain is felt in the pelvis and small of the back, increasing after exercise. Just before the menses the pains may become colicky. Pregnancy terminates either in abortion or it runs a normal course, but is followed, during the puerperal state, by perimetritis, perioöphoritis, or circumscribed peritonitis. After delivery the symptoms increase in severity. Forced movements, running, dancing, even coitus become painful. Prior to the menses severe symptoms appear in the shape of colic which confines the patient to bed. The menstrual type is changed. It becomes irregular, sometimes profuse, sometimes scanty. The general nutrition suffers. The patient emaciates, loses cheerfulness and desire to work; finally typical hysteria develops with its manifold nervous symptoms.

Examination of such women shows increased secretion from the genitalia. The vulva is pale, even unusually dry; at the opening of the excretory duct of Bartholin's gland a redness, like the tail of a comet, is visible.

Pressure upon Bartholin's gland expresses a vitreous or milky secretion. A similar redness also appears upon one or the other peri-urethral (Skene's) follicle, or in a groove between the caruncula and labia minora. A few condylomata are

perhaps found at the border of the labia minora, the posterior commissure, or around the anus.

The vagina does not exhibit pronounced morbid changes, perhaps merely redness and erosions of the posterior part. The portio vaginalis is somewhat enlarged and fluffy. Increased secretion, which is usually purulent but may not present a morbid appearance, flows from the cervical canal. On palpation the uterus is found somewhat enlarged and tender on pressure; if there have been perimetral and parametral inflammations, it is displaced and fixed in the abnormal position. The ovaries are enlarged, displaced and tender on pressure, and the broad ligaments are shortened and more rigid.

IV. The diagnosis of blenorrhagic disease is not very difficult in acute forms. It depends upon the profusely secreting inflammation of the vulva, urethra, and vagina, but particularly upon the demonstration of the gonococci. The diagnosis of the chronic form is more difficult. The absence of gonococci in these cases does not exclude gonorrhœa. Hence Saenger (1889) lays emphasis upon the clinical standpoint and mentions the following clinical criteria:

1. Demonstration of acute or chronic gonorrhœa in the male.

2. If this is wanting, a reliable history of previous gonorrhœa in the male.

3. Ophthalmo-blenorrhœa in one or more of the offspring.

4. Co-existing or previous purulent catarrhs, when other causes may be excluded.

5. Disease of Bartholin's glands and redness along the excretory duct.

6. Condylomata.

7. Purulent or muco-purulent discharge from the cervix, in the absence of erosions or pseudo-erosions of the os uteri.

8. Disease of the uterine appendages of the pelvic peritoneum.

V. The question next arises whether the entire nosological picture just depicted is due to the gonococcus.

In opposition to the view maintained by Bumm (1887) and Saenger (1889), that a part of the disease, especially that of the internal genitalia, the tubes, parametria, and ovaries, is due to mixed infection, Wertheim (1892) has demonstrated that the entire symptomatology, even of chronic gonorrhœa, is due

to the gonococcus alone. The demonstration of gonococci in the pus and tissue of diseased tubes and ovarian abscesses, the experiment of producing circumscribed peritonitides by pure gonococcus cultures, and particularly the culture of gonococci from tubal and ovarian pus with inoculation of the male urethra and production of typical gonorrhœa, constitute positive proofs. A few cases have been reported in which, in pyosalpinx and peritonitis, pus cocci were found in addition to gonococci, or the former alone were present. In these cases, however, we have to deal probably with secondary infections in which the gonococci were finally overcome.

There appears to be no doubt that the gonococcus, when placed in the vagina or upon the cervix, spreads to the uterus, the tubes, and through the walls of the latter to the peritoneum and ovaries, and that it alone produces the entire dismal symptomatology of gonorrhœa in the female.

I. URETHRITIS.

General Remarks.

The statements concerning the frequency of this disease differ in a very striking manner. Swediaur states that he never observed a case of urethritis in the female. Ricord says that in contagious blenorrhœa of the female the urethra is often affected alone, or at least participates in the disease of the other mucous membranes. The recent writers agree almost unanimously concerning the frequency of blenorrhagic urethritis, and that it is never absent in cases of recent infection. Zeissl alone maintains that there are only 5 cases of urethral blenorrhœa among 100 cases of blenorrhagic vaginitis. This striking difference of opinion is owing to the rapid and mild course of the acute stage, and to the readiness with which chronic urethritis in the female is overlooked. Cheron states that in the female there is one acute urethritis to five chronic urethritides.

Symptomatology.

Thanks to the short and straight course of the female urethra, its simple structure, the absence of large glands, female urethritis is a milder affection than in the male.

After a period of incubation, which Martineau estimates at

two to five days, the urethritis begins, in acute cases and in sensitive women, with slight chilliness, which appears only on one or two evenings, and slight malaise. At the same time the patients complain of mild burning and tickling on micturition; in some cases this is quite annoying for several days. These are the only perceptible symptoms, but not infrequently subjective symptoms are entirely absent, or there is slight burning during micturition which is ignored or overlooked.

On examination of the patient, who should not have urinated for several hours, the orifice of the urethra will be found swollen and reddened, the urethral mucous membrane intensely reddened and perhaps somewhat prolapsed. On passing the finger into the vagina the urethra is felt as a firm cord which is tender on pressure. On pressing from behind forwards along its course often quite large drops of creamy pus escape from the orifice. On microscopical examination this shows the same elements as in man, especially numerous gonococci in the pus cells.

If the patient urinates into two vessels, we will find cloudy urine in the first, clear urine in the second vessel. Cloudiness of the second urine indicates coincident cystitis. There is no division of the urethra into two parts as in man. The female bladder possesses a true sphincter, which consists of smooth and striped muscular fibres, and forms a sharp boundary between the urethra and bladder. There is no neck of the bladder in the female, in the sense of a part which belongs at times to the urethra, at times to the bladder. However full the female bladder—and, as is well known, its capacity is greater than in the male—all the urine remains in the organ, the urethra always forms a short canal, which is open anteriorly, firmly closed towards the bladder, so that regurgitation of pus from the urethra into the bladder is impossible.

The few subjective symptoms which constitute the acute stage have usually disappeared in three weeks, at the furthest, and the patients, and indeed many physicians, then regard the blenorrhœa as cured.

But this is not true. Female urethritis passes into a chronic stage much more often than has been hitherto believed. This, while not so serious, so far as our imperfect knowledge goes, as chronic blenorrhœa in the male, nevertheless presents sufficient danger. In the first place it may exacerbate after external

irritants, as in the male. The patient not alone suffers from a contagious disease, or, at least, one which often becomes so at each relapse, but it may extend beyond its original boundaries and give rise to the symptoms of temporary urethro-cystitis, which is similar to that in the male, buts runs a milder and more rapid course.

The symptoms of chronic urethritis in the female are exclusively objective. They are found on careful examination of the urethra after the patient has not urinated for several hours. Pressure on the urethra, from behind forwards, usually forces out a drop of thin, milky muco-pus. If the patient is allowed to urinate, after the vulva has been carefully cleansed of mucus, we find either slight cloudiness of the urine or clap shreds, as in the male.

The female urethra is rich in follicles, which are situated along the entire mucous membrane as well as at the orifice. These follicles may take part in the blenorrhagic process. They become swollen and sensitive and form small nodules, which disappear or enlarge and open into the urethra without being attended by further consequences.

There are two varieties of follicles which especially merit our attention. Both are situated in the vicinity of the external orifice.

One form is situated in the lower wall of the urethra, to the right and left of the median line, and their two excretory ducts empty just at or within the external orifice. Skene (1880), Lormant (1883), Hamonic (1883), Boehm (1883), and Van Cott (1887) have made a thorough study of blenorrhagic inflammation of these glands and the termination in suppuration with the development of urethro-vestibular and urethro-vaginal fistulæ.

The second variety of these follicles is peri-urethral in the broader sense of the word. They number four or five, and usually surround the meatus, alongside of which they often empty with peculiar pocket-shaped dilatations. If one or both varieties of follicles are attended by blenorrhagia, careless examination may lead us to diagnose blenorrhœa of the urethra itself.

In examining a woman with blenorrhœa, pressure on the orifice extrudes pus, which is supposed to come from the urethra. But if the patient is allowed to urinate previously, *i.e.*,

if the urethra is cleansed, and the parts are carefully inspected during the examination, we convince ourselves that the pus appears in the fissures at the side of the urethra. If the follicles had been previously squeezed and the pus removed, and if the urethra is then examined from behind forward, or if the patient is allowed to urinate, we can also demonstrate the presence of chronic urethritis.

Blenorrhagic inflammation of the follicles at the orifice is either chronic, *i.e.*, a small quantity of pus is secreted without any symptoms, or it is acute and relapsing. One or another of the follicles enlarges, the meatus becomes unsymmetrical, the mucous membrane over the follicle is reddened. A small point of pus soon appears, an abscess forms in the follicle, rapidly opens and discharges, and closes with equal rapidity. In a short time this process is repeated in the same or another follicle, and this may continue for a long time. Slight pain on palpation is the only symptom of this affection, which is usually unnoticed by the patient. Guérin called it external urethritis, and proved its blenorrhagic character and contagiousness by some accurate observations. Small, insignificant fistulæ may result from the rupture of the abscess into the urethra and vulva at the same time.

Pathological Anatomy.

The anatomy of the disease has been little studied. In a patient who died of typhoid fever, Mercier describes the mucous membrane of the blenorrhagic urethra as uniformly red in the lower part, the remainder was injected in patches.

In a servant who died of cysto-pyelitis and nephritis, Murchinson found both kidneys in a condition of acute nephritis, the renal pelves and ureters filled with pus, the bladder distended with purulent urine, its mucous membrane, like that of the urethra and vagina, intensely reddened.

Examination with the endoscope in the acute stage usually shows uniform redness, swelling, and velvety loosening of the mucous membrane. In chronic cases the mucous membrane is reddened in patches and stripes, or the redness, associated with slight erosion, merely surrounds the openings of a few, usually prominent, follicles. I never found granulations, but the number of cases which I had the opportunity to examine was small.

Diagnosis and Prognosis.

The diagnosis is evident from the symptoms just described. Attention must be paid particularly to the origin of the pus, whether it comes from the urethra or the follicles of the meatus. In chronic urethritis frequent examination is necessary, especially after the patient has not urinated for some hours. In otherwise negative cases, a decision is arrived at from examination of the urine after its retention for several hours and after careful cleansing of the vulva. This is always annoying, and often impracticable for external reasons.

The prognosis of urethritis in the female is always more favorable than the corresponding affection in the male. Chronic urethritis is much more amenable to treatment, the conditions for recovery are more favorable. Unfortunately the latter affection often escapes our observation and treatment.

Treatment.

In the acute stage the treatment is hygienic and symptomatic. The regimen, as regards exercise, food and drink, is the same as in the male.

If the subjective symptoms have disappeared but suppuration persists, balsams internally, and local injections of hypermanganate of potash and sulphate of zinc, are indicated. The injections are made, when the bladder is moderately full, with the ordinary clap syringe half filled. The bladder should always contain urine in order to prevent direct action of the injection fluid upon the wall of the bladder, provided it enters the bladder, which is more apt to occur on account of its anatomical structure.

The torpidity of female urethritis soon permits active local treatment, particularly the application of tincture of iodine or a solution of nitrate of silver (2 to 5 per cent.) through a short endoscope or by means of little tampon brushes (smooth narrow strips of wood covered with cotton).

Folliculitis of the urethral meatus is an obstinate affection, which is only cured by destruction of the follicles. This is done with a narrow stick of lunar caustic, or, better still, with the fine point of a Paquelin cautery.

II. VAGINITIS.

General Remarks.

Vaginitis occupies the most peculiar position among the more common blenorrhagic affections. Originally regarded as the most frequent form and the prototype of female sexual blenorrhœa, its blenorrhagic character is now denied by many. Bumm endeavored to show by a series of careful investigations that a proliferation of gonococci in the vagina and their entrance into its epithelium does not take place. He claimed that the site of blenorrhœa in these cases is the cervical canal or uterine cavity, and the pus produced in these parts, and which contains gonococci in abundance, flows into the vagina. Here it irritates and macerates the vagina and causes inflammation of its surface, just as blenorrhagic secretion entering the preputial sac produces balanitis, which is not regarded as blenorrhœa. The pus from the cervix mingles with the secretion of the vagina and therefore contains gonococci, but the vaginitis itself is catarrhal, *i.e.*, it results from simple irritation and is not a blenorrhagic affection.

Bumm attempted to prove this view in various ways. In the first place he claims that, according to his microscopical examinations, gonococci only enter cylindrical epithelium, that they cannot pass through pavement epithelium, and whenever cylindrical and pavement epithelium come in contact, the gonococci disappear where the latter begins. The vagina is covered with firm pavement epithelium, which resists the entrance of gonococci. We have already stated that this view is disproved by recent investigations.

Bumm also examined portions of the inflamed mucous membrane of the vagina, and never discovered gonococci therein.

Finally, he kept blenorrhagic secretion in direct contact with the vaginal mucous membrane for twelve hours and could never produce vaginitis in this way. The vagina also remains normal, despite the most severe, cocci-containing cervical or uterine blenorrhœa, which permits the abundant secretion to flow into the vagina, provided the irritant action of this secretion is prevented by securing its thorough removal. On the other hand, the delicate epithelial lining of the youth-

ful vagina was not absolutely proof against the invasion of gonococci, but the symptoms ran a much more mild and rapid course.

That there is a vaginitis which is associated with blenorrhœa of the urethra and of the cervix and uterus, cannot be denied. But according to these views of Bumm and the more recent investigations of Steinschneider, the cervical or uterine blennorrhœa is produced by the primary infection, and the secretion stagnates in the vaginal canal and produces vaginitis. In accordance with this notion, cervical or uterine blenorrhœa must be present in every case of vaginitis, a point concerning which our present statistics are silent, but which Schwarz, as the result of his examinations, denies. That vaginitis may communicate blenorrhœa would be explained by the fact that, together with the secretion of the cervical canal, it also contains its gonococci, which proliferate in the vaginal secretion as in an incubator, and may even cover the vaginal epithelium, but do not penetrate it. In addition to the gonococci a considerable number of other cocci and bacteria also find favorable conditions for proliferation in the vaginal secretion.

These views are opposed by Schwarz in every detail. He states that in many recent cases vaginitis may be demonstrated although the uterus is entirely intact, that the obstinacy of the vaginitis proves its specific character, and that the presence of gonococci in the deepest layers of epithelium can be proven by scraping the vaginal walls with a curette, after previous irrigation of the vagina.

Saenger (1889) also states that the vagina remains free from gonorrhœal disease when its epithelium is firm and contains many layers, but that true gonorrhœal vaginitis does occur, even in adults, in young people, in pregnancy, in many women with delicate skin and blond hair, and when the entire mucous membrane is succulent. This opinion is confirmed by Toulon's investigations.

I am also convinced from my own experience that acute vaginitis may develop without disease of the cervical canal.

Symptomatology.

Like other blenorrhagic affections in the female, vaginitis possesses the peculiarity of running quite rapidly through the

acute stage, soon passing into a chronic stage, and of presenting relatively few symptoms during the acute period.

The following are the symptoms of acute vaginitis: In the beginning the patients experience a feeling of weight, dragging and burning in the genitalia, and there is increased secretion, at first mucous, then purulent, which stiffens the clothing, and has a yellowish color. The pains increase and radiate towards the pelvis and thighs; they increase on movement and defecation, and not infrequently compel sensitive women to take to bed. Slight chilliness and a feeling of dullness and fatigue are added, the secretion increases, and, by its irritation, causes more or less marked vulvitis, and also gives rise to intertrigo and eczema by flowing into the inguinal folds and upon the perineum and thighs.

In addition to the urethritis and vulvitis which are usually present, examination shows swelling of the introitus vaginæ. The fimbria and caruncles are swollen, their mucous membrane reddened and eroded; the swollen follicles are shown by punctate, dark, often elevated and intensely reddened spots. A considerable amount of creamy pus, which is neither viscid nor gelatinous, wells up out of the introitus, especially on pressure upon the perineum. On passing the finger into the vagina considerable elevation of temperature is felt, and the mucous membrane is also felt to be more rigid, its folds more prominent. In many cases the entrance of the well-oiled finger is impossible, the pain produced thereby so violent that spasm of the sphincter vaginæ (vaginismus) sets in.

As a matter of course examination with the speculum is impossible in these cases. In others this can be done, and the following changes are noticed after the pus has been wiped off: In places the epithelium seems to be lost, and superficial, easily-bleeding erosions are formed. In some cases, usually not the most acute ones, the markedly infiltrated folds appear to be covered by deep red granules, which are quite uniform and may attain the size of a hemp seed. The entire vagina then appears granular, a condition known as psorélytrie, vaginitis granulosa or papillaris. This form is especially frequent in gravid females. Martineau states that he found it particularly in scrofulous and cachectic individuals.

The mucous membrane of the portio vaginalis is also swollen, its follicles more prominent. Superficial erosions,

perhaps as large as a pea, are also found, particularly on the lower lip. In many cases—whether it is true of all I am unable to say—the orifice of the cervical canal is reddened, partly eroded, gaping, and from it escapes a tough purulent plug.

The course of the acute blenorrhœa is quite typical. The symptoms attain their height in eight to ten days and then slowly diminish, so that the vaginitis is usually cured in three to four weeks. But relapses are not rare. These occur in part after external noxious influences, but particularly after menstruation, which is always followed, even if the process is entirely healed, by a short stage of subacute vaginitis with increased secretion and redness of the mucous membrane.

Chronic vaginitis, which is a sequel of acute vaginitis that is maintained by local irritation or by frequent relapses, is either diffused over the entire mucous membrane, or localized.

In both cases subjective symptoms are absent; in the former the secretion is still considerable, in the latter it is not notably increased. In diffuse vaginitis examination with the speculum shows thickening of the mucous membrane, whose folds are very prominent and covered with granulations; the color is partly red, partly even livid; erosions are found particularly in the fornix and on the portio vaginalis.

In the localized cases, one or more patches of reddened, partly eroded and swollen mucous membrane are seen in the deeper portions of the vagina, particularly in the posterior fornix.

Chronic vaginitis terminates in a change which is found with special frequency in prostitutes. This is a form of fibrous degeneration known as xerosis vaginæ. The mucous membrane becomes rigid and thick, it dries from destruction of the follicles, the epithelium is thick and white, like chronic stomatitis with psoriasis mucosæ, and the condition is incurable.

Diagnosis and Prognosis.

The diagnosis may be made from the symptoms mentioned. The proof of its blenorrhagic character is obtained from the presence of co-existing blenorrhagic affections and the demonstration of gonococci.

With regard to the former, the urethra must first be examined. Acute or chronic urethritis, the demonstration of

suppuration, with or without inflammatory symptoms, from the urethra or the follicles around its orifice, and the discovery of gonococci, which is hardly ever attended with difficulty, are important diagnostic indications.

The discovery of gonococci in the vaginal secretion itself is more difficult. In the first place it contains a large number of other micro-organisms which interfere with the recognition of the gonococci. Indeed, Lomer states that the vaginal secretion is unsuited to the demonstration of gonococci. Bumm also attaches little importance to examination of the vaginal secretion, in which, according to his belief, gonococci occur only secondarily. Schwarz, on the other hand, maintains the existence of a primary vaginal blenorrhœa, and discovered gonococci in the vaginal mucous membrane, after irrigating the canal freely and removing the secretion and micro-organisms. After the irritating irrigation a reaction develops in the vaginal mucous membrane in the shape of active cell proliferation, which brings the gonococci, intra-cellular and free, to the surface. If some secretion is now scraped with the knife or curette from the mucous membrane, we can, as a rule, discover the gonococci.

The prognosis must be made with great caution. Vaginitis itself is often cured with great difficulty, and especial consideration must be paid to the fact that an extension of the process to the uterus may give rise to the most serious, even incurable complications, which may seriously endanger not only health but even life.

Treatment.

Acute vaginitis not infrequently runs its course spontaneously, if cleanliness and removal of the secretion are attended to. The subacute and chronic forms are much more obstinate. Hence the treatment of acute vaginitis is expectant and mildly astringent, that of chronic vaginitis is strongly astringent, even caustic.

In the first and most severe stage of acute vaginitis treatment is usually impossible on account of the violent pains which characterize the affection. It is then our object to secure a rapid termination of the acute stage, by rest in bed, regulation of the bowels, cool sitz-baths, cold compresses on the genitalia and perineum, mild and unirritating diet. Potas-

sium bromide, chloral hydrate and morphine relieve the nervous excitement which is so frequent at this period.

When the acute symptoms have subsided so that instruments may be introduced into the vagina, we resort to local treatment, consisting in the application of astringents and the removal of the accumulated secretion.

Treatment which is carried out under the control of the eye is always the most effective. It is therefore best to introduce a speculum, carefully cleanse the vaginal mucous membrane with tampon brushes and then to apply the astringent to the vagina by means of these brushes or by irrigation. We prefer 1 to 2 per cent. solutions of permanganate of potash. Applications of a 1 per cent. solution of nitrate of silver may be used, in addition, every two or three days, if the symptoms are subacute, especially in vaginitis granulosa. After each cauterization or irrigation the vagina is filled with cotton tampons, which are fastened to one another with thread and introduced through the speculum.

This method of treatment, which is entirely in the hands of the physician or a midwife, is usually impracticable, except in a hospital service. And so the treatment must often be carried out by the patient. In such cases it is best to use an irrigator, to the rubber tube of which is attached a vaginal tip, a slightly curved hollow bulb, whose tip is perforated like a sieve. For irrigation we order 1 per cent. solutions of permanganate of potash, chlorate of potash, sulphate of zinc, or a 2 per cent. solution of alum, the vagina being irrigated three times a day with about 2 quarts of the slightly warmed solution. The part which first enters the vagina coagulates the secretion and removes it in shreds, the remaining fluid comes in direct contact with the vaginal walls. Tamponing of the vagina must usually be abandoned in these cases, as the tampons recommended are not suitable. The physician should examine with the speculum every three or four days, and may then make applications of 1 per cent. solution of nitrate of silver, tincture of iodine or liquor ferri sesquichlorati. These remedies, applied every third day, are to be recommended particularly in subacute cases.

In obstinate subacute vaginitis the astringents mentioned should be applied daily for several successive days. The vagina is brushed and tamponed. On the following day the

tampon is removed, the mucous membrane cleaned and again brushed. If this is repeated for several days, the mucous membrane begins to exfoliate in shreds. The brushings are then discontinued, but the above-mentioned irrigations are employed daily until the mucous membrane is regenerated; if it has not regained the normal appearance, the procedure is again begun. Alum, which is dusted on tampons or sewed up in bags of mull, acts very vigorously in this way. A mixture of powdered sulphate of copper and alum (10:100) acts in the same way. Other astringents, such as sulphate of zinc, sulphate of copper, alum in gelatine capsules, are introduced into the vagina in a similar manner.

Corrosive sublimate has been largely used in recent times. Schwarz (1887) recommended the following procedure: The vulva and vagina are first cleansed and washed with a .1 per cent. solution; then the vagina is carefully scrubbed, through a speculum, with plugs of cotton dipped in a 1 per cent. solution; then a tampon of iodoform gauze is introduced. This is repeated in three days; at the end of three days more the tampon is removed, and the patient now continues irrigations with $\frac{1}{2^{0}0}$ per cent. solution twice a day for two weeks.

Saenger also gives the preference to corrosive sublimate. In order to prepare the way for the better entrance of the sublimate, he begins with the introduction of a tannin-glycerin tampon. On the following day the vagina is cleansed by irrigation with soap and water, then corrosive sublimate (1:500–1000) is introduced through a Ferguson speculum and soaked up with cotton until it remains clear. Then a tampon of iodoform-glycerin is inserted. In obstinate cases the parts are also brushed with tincture of iodine. Foveau (1889) first brushes with biniodide of mercury (1:4000) and then applies an iodoform-glycerin tampon. Brennan (1889) irrigates the vagina, then applies a 2–4 per cent. solution of chloride of zinc, then a tampon of equal parts of boracic acid and glycerin.

Great care must be devoted to disease of the portio vaginalis and cervical canal. Erosions of the portio vaginalis are to be touched up; in suppuration from the cervical canal and uterus, the parts are brushed with astringents or injections made with Braun's syringe. Hypertrophy of the portio vaginalis with development of granulations requires vigorous cauterization, even partial excision, *i.e.*, surgical interference.

In chronic cases attention must always be paid to the general constitution. The nutritive disturbances, constipation and anæmia, which are so frequent in women, must be relieved by suitable remedies.

Menstruation indicates complete rest until a few days after its cessation, and vigorous cauterization is especially contra-indicated.

Acute vaginal blenorrhœa may also be the subject of treatment during pregnancy, but, as a matter of course, with the utmost caution. The cure of chronic blenorrhœa under such conditions is a labor of Sisyphus, which it is best to put off until parturition is completed.

CHAPTER VI.

COMPLICATIONS OF BLENORRHŒA IN THE FEMALE.

I. VULVITIS.

General Remarks.

Among diseases of the sexual organs in the female, vulvitis occupies a position analogous to that of balanitis in the male.

Diseases of the vulva may occur independently as the result of various local irritants, and are then non-infectious, purely local affections, superficial inflammations. Corresponding to the hybrid anatomical position of the vulva between integument and mucous membrane, they also hold pathologically a position midway between catarrh and acute eczema.

Similar forms occur as part-symptoms of acute urethral and vaginal blenorrhœas. It has not been decided whether these vulvitides, which are so common as attendants of acute sexual blenorrhœa, are real blenorrhagic affections, or merely the result of irritation by the blenorrhagic secretion. The entirely analogous balanitis is certainly the effect of irritation by the secretion.

In children, on the other hand, there is a true, primary, blenorrhagic vulvitis, which is caused by the transmission of blenorrhagic, gonococci-containing secretion, and by the local increase of the cocci upon the vulva; it remains localized or extends to the vagina. Apart from Fraenkel's cases, which are not entirely clear, Aubert, Widmark, Cséri, Lenander and Israel have reported instances in which the presence of gonococci and usually the infection were demonstrated.

Symptomatology.

Although vulvitis usually heals rapidly and easily, it often produces very alarming symptoms. Whether it occurs alone or as a complication, it always gives rise to itching and burning

which soon increase to pain. The passage of urine over the inflamed surfaces is especially painful; movement, particularly walking, is also painful or even impossible. The second striking symptom is the abundant secretion of creamy, foul-smelling pus.

On examination in the most acute cases, the inner surface of the thighs, often almost to the knee, and the inter-crural folds, are reddened, partly eroded and weeping. The labia majora are swollen, reddened and hot. Their surface, especially at the edge, and the hairs of the pubis, are sticky, and covered with crusts of pus. The labia minora are often so œdematous that they protrude beyond the labia majora. Their surface likewise, together with the inter-labial folds, is reddened, swollen, partly eroded. The lining of the vestibule is intensely swollen, of a deep red color, loosened, often velvety, even finely granular. Deeper red patches or punctate, slightly elevated spots, which belong to the swollen follicles, are seen not infrequently. The vicinity of the excretory ducts of Bartholin's glands is also characterized by more intense redness. The entire diseased surface is covered with a more or less thick layer of pus, containing numerous micro-organisms, also gonococci if the disease is blenorrhagic. Their diagnosis, however, is often rendered very difficult by the multitude of other cocci and bacteria.

In addition to the acute purulent vulvitis just described, we also find milder, subacute, muco-purulent vulvitides, characterized by slight intensity of the subjective and objective symptoms.

Vulvitis usually terminates in recovery. It rarely becomes chronic, and only after gross neglect. The secretion then remains increased, slight itching and pricking become permanent, the lining membrane of the vulva becomes slightly thickened, of a slate gray to violet color.

Chronic vulvitis is more often localized. The process disappears from the surface, and retires to a number of glands, among others to the glands of Bartholin, which will be discussed separately. But the other vestibular glands may also take part in the affection—for example, the glands around the orifice of the urethra, the numerous glands and follicles on the inner surface of the labia minora, which are partly scattered, partly arranged in groups. In these localized, extremely

insidious forms, which are usually entirely devoid of symptoms, the vulva appears to be normal, pale red in color, and the secretion is not increased. It is only on careful examination that we find, at one or more of the places mentioned, one or a few dark red patches, often not larger than a lentil, whose mucous membrane is fluffy or velvety, even granular; perhaps a few swollen follicles, which can be better seen than felt, are situated underneath. A little secretion, mucus or muco-pus, can be squeezed from the excretory ducts of Bartholin's and the peri-urethral glands, and Schwarz states that small painful ulcers may develop from the suppuration of such follicles.

Diagnosis.

The diagnosis is made without difficulty from the symptoms mentioned. It is more difficult to distinguish the blenorrhagic from the non-blenorrhagic forms. It must be kept in mind that blenorrhagic vulvitis occurs only in children as an independent affection, but that it usually extends in such cases to the vagina. The demonstration of gonococci is usually not difficult in these cases. In adults vulvitis is rarely an independent affection, but is a link in the chain of an extensive blenorrhagic process, which usually involves the urethra, vagina and cervix. These parts should therefore be examined in vulvitis. The existence of vulvitis, while the urethra, vagina, and uterus are healthy, speaks against its blenorrhagic character. We must then examine for all those factors which are usually followed by symptomatic vulvitis, such as soft chancre, primary and secondary syphilitic lesions; finally, we must take into consideration those conditions which favor the development of idiopathic vulvitis, such as masturbation, uncleanliness and accumulation of sebum, pregnancy.

Treatment.

The treatment of acute vulvitis is quite simple. Washing with lukewarm baths and irrigations, insertion of cotton between the labia, into the vestibule and the inter-labial folds, in order to prevent contact of the inflamed parts, and absorption of the secretion, often prove sufficient. In more obstinate cases the application of astringents materially aids recovery.

So long as the inflammatory symptoms are violent, we may use plumbum aceticum basicum solution (℥ iiss: ℥ vj.), into which pledgets of cotton are dipped and inserted into the parts. When the acute symptoms have subsided we may apply, in the same way, other astringents, such as tannin, sulphate of zinc, and alum in ½ to 1 per cent. solutions. In these cases the most effective agent is nitrate of silver in ½ to 5 per cent. solution, brushed upon the inflamed parts, which are then covered with dry cotton.

Schwarz (1886) soaks cotton tampons in .1 per cent. solution of corrosive sublimate and applies the Labarraque dressing, *i.e.*, calomel after the previous application of a 5 per cent. solution of sodium chloride.

As a matter of course other blenorrhagic affections which may be present, must be treated in a suitable manner.

Chronic vulvitis is much more obstinate, and vigorous local treatment is indicated. The patches of infiltrated, swollen, perhaps suppurating glands can usually be cured only by the application of caustics. Brushing with concentrated solutions of nitrate of silver (1:10 to 5), with the solid stick or chloride of iron effect material benefit, but I have always found that the best plan is the use of the Paquelin cautery, whose finest tip, brought to a white heat, is carried gently into the larger follicles or is applied several times to reddened patches.

II. INFLAMMATION OF BARTHOLIN'S GLANDS.

General Remarks.

Inflammation of Bartholin's glands, extending from the vulva, is a frequent complication of blenorrhagic infection in the female. The question whether every Bartholinitis is blenorrhagic in origin is not yet decided.

Bonnet (1889) regards 9 cases out of 10 acute Bartholinitides as blenorrhagic, and chronic Bartholinitis as usually specific. Feleki and Pollaczek (1889) distinguish 4 varieties of the disease: 1, a simple, and 2, a blenorrhagic catarrh of the excretory duct, 3, a simple, and 4, a blenorrhagic suppurating Bartholinitis. Saenger (1889) maintains that non-blenorrhagic disease of Bartholin's glands is at least extremely rare, and he regards the chronic cyst-producing affection as uniformly gonorrhœal.

In 1883 Arning had demonstrated the presence of gonococci in the pus of acute and chronic Bartholinitis. Bumm, Saenger, and Gersheim assume a mixed infection, particularly for the suppurative forms, and they found pyogenic organisms, streptococci, in addition to the gonococci. In a case of acute Bartholinitis, Toulon (1893) found gonococci upon the epithelium of the excretory duct which had been converted into pavement epithelium, but not within the gland itself.

a.—ACUTE BARTHOLINITIS.

Symptomatology.

Acute Bartholinitis either develops directly as a complication of acute blenorrhœa or from an exacerbation of the inflammation in chronic Bartholinitis, even during long-standing chronic blenorrhœa.

It runs its course as a very acute inflammation with a tendency to suppuration. Whether as the result of acute recent or chronic inveterate blenorrhœa, it generally follows some exciting cause, such as neglect, forced coitus in prostitutes, excessive exercise. A swelling develops within a few hours in one of the labia majora, usually the left, accompanied by all the signs of acute inflammation, such as redness, elevation of temperature, intense pain. On examining the reddened, swollen labium majus (the labium minor of the corresponding side is usually implicated in the œdema) we feel, in the posterior third, a firm, tense, sharply defined nodular swelling, as large as a hazel nut, which can be felt distinctly beneath the integument of the labium. Pressure on this nodule discharges pus from the excretory duct of Bartholin's gland, though not in all cases. The inflammatory symptoms, the swelling and redness, increase for two or three days, and extend to the præputium clitoridis and to the inguinal region on the same side. The formerly sharply defined nodule loses its distinct contour and is lost in the general swelling; it becomes doughy, and finally (usually very soon) fluctuation is felt, which is first distinct upon the inner surface. The beginning of suppuration is generally signalized by chilliness; the pains, hitherto violent only on contact, become throbbing, dragging, shooting, and are also very severe spontaneously. After gradual thinning of the skin, perforation takes place, usually upon the inner surface of the labium, more rarely in the fold between the la-

bium majus and minor. In very rare cases the pus perforates the capsule of the gland, but not the integument, and perforation may then occur into the perineum or even the rectum. Fistulæ may develop if the perforation occurs in two places at the same time. The perforation opening is usually quite large, jagged, with gangrenous or thin livid edges; the destruction not infrequently extends farther after perforation. The discharged pus is bloody, foul smelling, not infrequently mixed with gangrenous shreds. These spontaneously rupturing abscesses and the accompanying gangrene often cause considerable destruction of tissue, which exhibits a rapid tendency to recovery as soon as perforation takes place.

The termination in induration is much rarer than that in suppuration. The inflammatory symptoms then subside before suppuration has begun, and the gland remains as a firm nodule, which soon becomes painless. The termination in resolution rarely occurs, however early treatment is adopted, and never occurs when the disease runs its course spontaneously.

Treatment.

The therapeutic indications are very simple. So long as there is no suppuration, vigorous antiphlogosis is indicated, rest and application of cold.

As soon as suppuration is demonstrable, surgical interference must be adopted. The pus must be evacuated as rapidly as possible by long incisions, the abscess cavity closed by antiseptic treatment, introduction of iodoform, irrigation with solutions of corrosive sublimate.

In the rare cases of induration poultices often produce absorption. Otherwise this painless but usually annoying symptom is relieved by excision and enucleation of the nodule.

b.—CHRONIC BARTHOLINITIS.

Chronic Bartholinitis occurs, although rarely, as a sequel of acute non-suppurative or partly suppurative inflammation. It occurs much more frequently as a complication of chronic blenorrhœa. In the former event the disease extends to the parenchyma of the gland, in the latter it is confined to the excretory duct. If the gland is affected it is usually felt as a

painless, firm nodule, pressure on which discharges muco-pus or a milky, even clear mucous fluid. This secretion, whatever its appearance, usually contains gonococci, *i.e.*, it is contagious.

In other and more frequent cases increased firmness of the gland cannot be felt. We then find the mucous membrane around the excretory duct reddened, perhaps slightly loosened. Secretion is not discharged spontaneously. But if pressure is exerted on the vicinity of the gland, a mucous, milky, gonococcus-containing secretion escapes, either in drops or in a large amount. The large amount of secretion is explained by the fact that cystoid dilatations form in the gland or its excretory duct, and that these contain the abundantly-produced morbid secretion until the walls of the cyst acquire sufficient tension or it is evacuated by pressure from without. If the patient is examined when the cysts are filled with secretion, the escape of muco-purulent fluid from the excretory duct very soon clears up the diagnosis. But if the cyst has just been emptied and no secretion appears, the redness around the excretory duct will, at the most, arouse suspicion. But we often cannot make a diagnosis of the affection, and hence of the fact that the woman is the bearer of an infectious blenorrhagic process, inasmuch as examination of the other genitalia is followed by negative results. Indeed, chronic Bartholinitis, like the disease of the peri-urethral follicles, is often the sole localization of chronic blenorrhœa in the female.

Both affections are important in this respect, particularly to the police surgeon, who must attend to the examination of prostitutes. If the inspection hour is known to the prostitutes, the latter, many of whom suffer from chronic localized blenorrhœa, may squeeze out the cysts, either intentionally or unintentionally, while washing the genitalia, and thus often remove the only appearance which may prove the existence of blenorrhœa and the infectiousness of the patient.

Chronic Bartholinitis, like peri-urethral and cervical blenorrhœa, explains some hitherto obscure points in the pathology of blenorrhœa.

It explains the fact, frequently observed by competent authorities, that a woman, from whom a man has undoubtedly acquired blenorrhœa, may be examined and regarded as healthy, if the examination is made at a time when the secretion from the peri-urethral or Bartholin's glands is not visible.

It also explains the fact that a woman may infect some, but not all, of several men with whom she has cohabited in rapid succession. Some found the secretion from the gland at the time of coitus, the non-infected ones did not.

Le Pileur (1877) was the first to call attention to the infectiousness of this secretion, and the gonococci which have been found in it remove all doubt.

The affection is extremely obstinate. It may exacerbate and lead to inflammation and suppuration under the influence of irritating causes. Spontaneous recovery is hardly ever to be looked for.

Treatment.

In chronic cases the excretory duct is always dilated, so that it is possible, by means of an Anel syringe, to inject astringent and caustic fluids into the duct and its cysts. But I regard this method of treatment as unreliable and tiresome. It is always best to introduce a grooved director into the excretory duct, to incise the latter and the cysts, and then to destroy them by cauterization. If the gland is indurated, it should be enucleated.

III. INFLAMMATION OF THE UTERUS AND ITS APPENDAGES.

The uterus and its appendages, when attacked by blenorrhœa, present various forms of disease, which are claimed by gynecology, and with which we will now concern ourselves very briefly.

a. Acute Blenorrhagic Metritis.—This disease is always the result of an acute blenorrhagic infection, and develops as the continuation of the blenorrhagic process in the vagina and cervical canal. Other symptoms of acute infection, such as urethral, vulvo-vaginal blenorrhœa, are also always present. Hardy reports a case of primary acute uterine blenorrhœa in which, unlike the ordinary ascending course, the symptoms of vaginal and urethral blenorrhœa did not develop until the end of a few days.

Acute uterine blenorrhœa, as the continuation of an acute infection, usually develops brusquely. Together with chill and fever, there appear rapidly increasing dull pains in the lower abdominal region and the small of the back. The patients,

who create the impression of a serious illness, take refuge in bed on account of the exacerbations of the pain on movement. On examination of the genitalia we find, in addition to the previously mentioned signs of acute blenorrhœa, that the portio vaginalis is swollen and plump, its mucous membrane is reddened, perhaps eroded. Violent pain is produced by bringing the portio vaginalis into the speculum or touching it with a tampon. Muco-sanguinolent, then sanguino-purulent, finally purulent secretion flows in large amount from the cervical canal. On palpation the uterus appears to be enlarged and is very tender. After a few days the acute symptoms subside and the disease recovers or more often passes into the chronic stage. The inflammatory symptoms may also extend to the tubes, ovaries and peritoneum; in the severest cases they may give rise to acute purulent peritonitis with a fatal termination. The extension of acute blenorrhœa to the uterine appendages is shown in Mercier's case, in which the patient died of typhoid fever. The patient was a prostitute, æt. nineteen years, who had been suffering from blenorrhœa for several weeks, acquired typhoid fever, and during its course experienced intense pains in the pelvis.

The autopsy showed: the inner surfaces of the labia majora and minora were swollen and reddened, excoriated here and there; the labia minora covered with small granulations. The bladder contained a small amount of purulent urine; its mucous membrane, especially at the orifice, was reddened, likewise the mucous membrane of the urethra and vagina; the folds of the latter were deepened. In the posterior fornix were small granular vegetations. The portio vaginalis was reddened, the broad transverse os and the cervical canal were bluish red in color. The cavity of the uterus had a dark color like the lees of wine. The Fallopian tubes presented signs of inflammation and contained muco-pus. The peritoneum was healthy, except around the fimbria and ovaries, where it was reddened and adherent to these organs.

Peritoneal exudations into the pelvis, around the tubes and ovaries and in Douglas's *cul-de-sac*, are more frequent. These usually suppurate and perforate; absorption is rare. Ceppi (1887) found gonococci in a circumscribed peritoneal exudation which was opened through the vagina.

b. Chronic Blenorrhagic Metritis. — This develops more

rarely than the acute form, and usually as a direct chronic complication of chronic blenorrhœa. It is observed particularly in young women whose husbands entered matrimony with a gonorrhœa which still contained gonococci. The cocci, whose virulence has been diminished by their long-protracted proliferation on the same soil, produce directly a chronic process. In many cases this is located in the vulva or its glands, but slight redness and the formation of granulations may also develop in the vagina. In other cases, however, the vulva and vagina appear to have been skipped and remain entirely normal, while the mucosa of the cervix and uterus is attacked at once. The morbid symptoms on the part of the vulva and vagina are mild and are attributed to the defloration, especially if they occur soon afterwards, and consist of burning and itching in the genitalia with somewhat increased discharge. The symptoms proper do not set in until the uterus is affected. The patients then experience dull pain in the pelvis and small of the back, especially after bodily strain, excesses in coitus, before and during menstruation. Examination with the speculum shows swelling, redness, slight eversion of the cervical mucous membrane with a little muco-purulent secretion. Digital examination shows slight enlargement and tenderness of the uterus.

Strains and excesses, menstruation, but particularly parturition and child-bed, produce exacerbations. At the menstrual period the exacerbation begins a few days before the period as violent colicky pains, the period is usually delayed, the menstrual discharge very scanty, and the muco-purulent secretion very abundant for some days afterwards. The premature occurrence of the menses and metrorrhagia are less frequent. These exacerbations may also further the extension of the process to the perimetrium, peritoneum, tubes and ovaries.

The treatment of gonorrhœal endometritis, which should always be intrusted to competent gynecologists, must be as radical as possible, in order to prevent the extension of blenorrhœa to the tubes, etc. With the exception of the first and most violent stage of acute metritis, it is always local and consists of irrigations and instillations, done through a uterine catheter, either with or without previous dilatation of the cervical canal. Saenger (1889) recommends solutions of corro-

sive sublimate, combined with 2 per cent. solutions of chloride of zinc, creolin, or creosote. Sinclair (1889) prefers tincture of iodine, which he applies for two or three days in succession, then waits until the scurf is exfoliated, and begins the applications anew.

Schwarz makes continuous irrigations of the uterine cavity with $\frac{2}{100}$ to $\frac{5}{100}$ per cent. solution of corrosive sublimate, or 1 to 2 per cent. solution of carbolic acid.

Perimetritis.—Noeggerath distinguishes three forms:

1. *Acute Perimetritis with or without Parametritis.*—The patients begin to complain soon after marriage; they grow tired easily, the menses become profuse, finally acute, and violent inflammation sets in. Or pregnancy sets in, during which the patients complain of vague pains in the abdomen, and it is not until child-bed that an acute parametritis or perimetritis develops. Or, finally, the women are suddenly attacked, during complete health, by an acute, foudroyant, fatal parametritis.

2. *Recurring Perimetritis.*—This form is associated with purulent salpingitis. Purulent masses, which are retained in the tubes, escape under the influence of fear, excitement, coitus, introduction of the uterine sound, and give rise to circumscribed perimetritis. The first attack is always acute, the exudation abundant and purulent. The subsequent attacks diminish in intensity and extent. At each seizure the patient experiences a violent pain, associated with nausea, which lasts a few days and is located between the second and third thirds of Poupart's ligament. The pain disappears in a few days, leaving behind shooting pains after meals, neuralgias in the hips and abdomen.

3. *Chronic Perimetritis.*—This is manifested by latero-version of the uterus, whose fundus is usually turned toward the right; tenderness in Douglas's sac, in which firm bands can be felt.

Salpingitis and Oophoritis.—Salpingitis is a frequent blenorrhagic affection—indeed, according to Saenger, it is the principal form of the disease. We have already mentioned its connection with recurring perimetritis. Tait and Howard reported cases of gonorrhœal pyosalpinx. In Westermark's case a pyosalpinx was mistaken for extrauterine pregnancy and removed by laparotomy. The walls of the extirpated

tube were infiltrated and thickened; in the purulent exudation were found typical gonococci. Ortmann's case is especially instructive. A woman, æt. twenty-two years, had been married for a year to a man whose history showed several attacks of clap. Eight weeks after the first confinement she was taken sick, and complained particularly of burning during micturition and violent pains in the abdomen. Examination showed enlargement of the left ovary, right oophoritis and salpingitis. Laparatomy and extirpation of both ovaries and tubes revealed: purulent salpingitis, hæmatoma ovarii, peri-salpingitis, and peri-oophoritis, on the right side. Catarrhal salpingitis, peri-salpingitis, peri-oophoritis, on the left side. Both tubes very sinuous and dilated, their contents purulent. A circumscribed abscess in the right tube. The right ovary as large as a plum and contains a cyst filled with blood, in addition to dropsical follicles. The pus in the right tube contains numerous gonococci which could be stained in a typical manner. The epithelium of the tubal mucous membrane is wanting; its folds have coalesced into high ridges, so that the deeper portions seem to be converted into cavities which are filled with blood and pus. The mucous membrane is thickened, markedly infiltrated, in a condition of purulent destruction in places, the muscular bundles are thinned, the intra-muscular connective tissue thickened.

Finally, Wenheim demonstrated the presence of gonococci in three cases, not alone in the tubal contents, but also in the tissue of the tubes. According to Saenger, salpingitis occurs as the direct extension of gonorrhœa from the uterus under the form of a pyosalpinx, with or without thickening of the walls; escape of pus from the tubes (due to external causes) gives rise to circumscribed pelvic peritonitis; oöphoritis develops almost exclusively from peri-oöphoritis, which in turn gives rise to secondary chronic oöphoritis, with disorders of circulation and ovulation, development of cysts, etc.

CHAPTER VII.

COMPLICATIONS OF BLENORRHŒA IN BOTH SEXES.

I. GONORRHŒAL RHEUMATISM.

General Remarks.

Gonorrhœal rheumatism is one of the complications which attracted the attention of physicians at a very early period. Petrus Forestus (1507), Musgrave (1703) and Baglivi mention it as a proof of the syphilitic character of gonorrhœa. Swediaur describes it in detail. Hunter, Selle, Cooper, Brodie, Eisenmann, Baumés and Carmichael report cases and discuss its connection with clap. Eagle (1836) attributes it to the untimely use of copaiba and to improper treatment of gonorrhœa. But it is not until the appearance of Brandes's article (1854) that the history of gonorrhœal rheumatism really begins, and since then it has become generally known and studied, and the subject of numerous monographs, theses and discussions.

Etiology.

From the time that the clinical side of gonorrhœal rheumatism was discussed, the specific character of the symptoms, its course and connection with clap were determined, another question was broached, *viz.*, its origin and mode of connection with gonorrhœa. This question was the subject of many discussions, and gave rise to several theories that bore the mark of the study rather than of the anatomical laboratory.

The first writers who connected blenorrhœa and rheumatism, regarded the latter as a direct blenorrhagic disease, placing it in the same rank with epididymitis and prostatitis. But

the observation that joint swellings may develop after other irritations of the urethral mucous membrane, especially after catheterization, soon led to the view that blenorrhœa acted merely as an irritant of the urethral mucous membrane, which provoked the rheumatism. But this irritation produced by blenorrhœa was supposed to possess a specific quality because, as Fournier emphasized, it is only the blenorrhagic and not the other forms (catarrhal) of inflammation of the urethra which produce rheumatism. Zeissl also gave in his adherence to this view.

Other writers, however, particularly Thiry and Guyon, adopted the opposing stand-point. They recognize no genetic connection between blenorrhœa and rheumatism, and believe that the blenorrhœa, as a depressing agent, merely favors the development of diatheses which have hitherto been latent in the individual.

To Guerin, Lorain and Lasègue the fact that blenorrhœa could produce remote localizations was a proof that it was a general disease. They believe that gonorrhœa has a long period of incubation and that no remote complications will ensue if we can master the disease while it still remains local, but that complications occur if the clap lasts beyond the stage of incubation. Martineau also favors this theory.

There is also a vaso-motor theory of the development of gonorrhœal rheumatism. This regards the disease as a vaso-motor disturbance, which is produced by reflex, vaso-motor irritants starting from the inflamed urethra. Lewin was the chief advocate of this theory.

The discovery of the gonococcus formed a landmark in this question. But it also taught that so-called gonorrhœal rheumatism is not, etiologically, a single disease. Thus in a series of cases which are characterized clinically by a mild course, the gonococcus has been demonstrated in the joints. Such cases are undoubtedly blenorrhagic, metastatic, due to the conveyance of the gonococci through the blood into the joints. It is an interesting fact that blenorrhagic vulvo-vaginitis and ophthalmia neonatorum may also give rise to arthritides in which gonococci have been found.

In a second group of cases which ran a more severe course, pus cocci have been found in the joints, and we evidently have to deal with a pyæmic process dependent on the blenorrhagia.

Finally, Guyon and Janet (1889) found micro-organisms in the pus of three arthritides, and, like Fuerbringer (1890), regard such cases as the result of ptomaine poisoning.

Symptomatology.

Among 2423 cases of blenorrhœa Grisolle observed gonorrhœal rheumatism 68 times (2.8 per cent.), and Besnier and Jullien also give a proportion of 2 per cent.

It is more frequent in men than in women, though the latter do not escape entirely. Age exerts no influence. It only complicates true blenorrhagic affections and is never observed in pseudo-blenorrhagic diseases, such as balanitis. But the old belief that it only complicates urethral blenorrhœa is erroneous. Recent cases have been reported in which the joint affection occurred in blenorrhœa of the vulva, vagina and conjunctiva. Lucas describes two cases of blenorrhœa conjunctivæ in infants who suffered from swelling of several joints after birth; the course of the disease led Lucas to make a diagnosis of gonorrhœal rheumatism. Hartley reports cases of vulvo-vaginitis in girls of three, four, five, seven and eight years who were attacked by swelling of the joints. In four cases gonococcci were found in the secretion of the vulvo-vaginitis.

There are no accurate statistics with regard to the period at which the disease begins. But observation and the study of numerous reports of cases seem to show with tolerable certainty that it is not the recent but the older cases of blenorrhœa that are complicated with rheumatism. Roustan states that it does not develop before the third week after infection. Struppi makes the interesting statement that in his eight cases of gonorrhœal rheumatism the affection always followed disease of the pars posterior, which was also complicated by prostatitis in three cases. Loeb also regards gonorrhœal rheumatism as a complication of posterior urethritis.

Gonorrhœal rheumatism usually attacks several joints, more rarely it is confined to one joint. Among 348 cases collected by Jullien, 205 were poly-articular, 143 were mono-articular.

The following statistics, collected from numerous writers, give the site of the disease:

Knee joint,	136 times.
Tibio-tarsal joint,	59 "
Wrist joint,	43 "
Finger joints,	35 "
Elbow joint,	25 "
Shoulder joint,	24 "
Hip joint,	18 "
Maxillary joint,	14 "
Metatarsus,	7 "
Sacro-iliac synchondrosis,	4 "
Sterno-clavicular joint,	4 "
Chondrocostal joint,	2 "
Intervertebral joint,	2 "
Peroneo-tibial joint,	1 time.
Crico-arytenoid joint,	2 times.
	376

Many attempts have been and still are made to construct for gonorrhœal rheumatism a special symptomatology which will always permit it to be distinguished from other diseases of the joints, but such attempts are fruitless. Although the disease possesses certain typical characteristics, it runs its course under various symptoms. We may furnish the following schema of the different varieties:

1. Articular Rheumatism
   - mono-articular
     - acute (arthritis).
     - chronic (hydrarthros).
   - polyarticular
     - acute.
     - subacute.
     - chronic.
2. Peri-articular (nodose) rheumatism.
3. Synovitis tendinum.

All these forms receive their characteristic impress as blenorrhagic diseases less from the clinical history than from the following circumstances: 1. They occur during a blenorrhagic urethritis and follow its course, acute exacerbations of the former being followed by exacerbation of the rheumatic complication, remission of the former by remission of the complication, and recovery of both occurring at the same time. 2. On fresh infection there is a decided tendency to recurrence of the complication. 3. These forms, although they begin acutely, present less acute symptoms than true rheumatism, and

always exhibit a tendency to pass rapidly into a subacute and chronic stage.

Arthritis Blenorrhagica.—This is the most frequent variety and is regarded as a prototype of blenorrhagic disease of the joints. It begins acutely or is preceded by a prodromal stage, consisting of malaise and tenderness in several joints. This is followed by very rapid onset of the arthritis. A rapidly increasing swelling develops in one of the large joints, usually the knee. The pain may be very violent or moderate, the exudation and tension usually very considerable, fluctuation always distinct. On account of the marked distention the joint is usually fixed in a semi-flexed position. The general symptoms accompanying this swelling are very acute in the first few days. Fever develops (with nocturnal exacerbations to 39.5° C. and morning remissions to 37.5° even to 36.8°) and continues for several days. But the symptoms of acute inflammation do not last long, although the exudation and the consequent swelling do not diminish. The pain and fever disappear, and merely a feeling of tension, due to the exudation, remains, so that the use of the joint is only hindered by the exudation. In the most favorable cases this subacute condition may disappear, by absorption of the infiltration, in a few weeks. But so long as any infiltration remains, an injury, especially one that causes an exacerbation of the urethritis, may produce an acute exacerbation of the process, with renewed fever and painful swelling. This exacerbation also disappears rapidly, but its frequent recurrence very strongly predisposes the process, which already exhibits a tendency to a chronic course, to pass into hydrarthros.

A rarely observed termination is that in suppuration. This is indicated by chills and violent fever during the acute stage. The swelling of the joint increases, its coverings, hitherto pale, become reddened, the pain increases in violence and becomes throbbing, pulsating. The capsule of the joint ruptures, the pus makes its way outwards between the sheaths of the muscles and tendons. If recovery does occur, ankylosis results, but this variety generally terminates fatally by pyæmia.

Voelker (1868), Hamonic (1887), and Martel (1887) mention, as a rare complication of acute articular rheumatism, phlebitis of the saphenous, femoral, and iliac veins. This usually ends in recovery, but may also end in obliteration or even in fatal embolism.

Hydrarthros.—The chronic inflammation develops either directly or as a sequel of arthritis after frequent relapses. In the former event there is a gradually increasing exudation and therefore swelling of the joint, without subjective symptoms. The patient usually discovers it accidentally. On examination of the joint, which is entirely free from pain on pressure and passive movement, distinct fluctuation is felt, as the result of the accumulation of fluid. If this is marked, extreme flexion and extension are prevented, but otherwise the functions of the joint are intact. In extreme grades the joint ligaments seem to be loosened.

This results in an often very striking abnormal mobility of the joint, which impairs the use of the limb. The hydrarthros is capable of extremely rapid absorption and may disappear spontaneously in a few days, while in other cases it resists treatment for months. When the disease lasts a long time plastic changes usually occur in the joint. Some of the exudation is absorbed, but crepitation and creaking set in, and deformities develop which interfere partly or entirely with the functions of the joint.

Acute Polyarticular Blenorrhagic Rheumatism.—This variety possesses the greatest resemblance to acute articular rheumatism, develops rapidly as a painful, often considerable swelling of several joints, attended by a non-continued fever. But there are always certain differences between it and acute articular rheumatism. The number of joints affected is never as large as in the latter disease. There are usually only two (symmetrical) joints attacked, very rarely more than three or four. The fever is not as high as in genuine rheumatism. In the latter several joints are attacked at the same time, the blenorrhagic form usually consists of several attacks of monoarticular rheumatism, recurring at short intervals. The simultaneous acute affection of two or more joints is rare. The tendency to relapse after morbific influences which act upon the blenorrhœa, is also peculiar to this form. A further characteristic is shown by treatment. It does not react to quinine and salicylate of soda as promptly as genuine rheumatism.

Subacute Polyarticular Blenorrhagic Rheumatism.—Next to arthritis this is the most frequent variety; it is analogous to the form just described, except that the fever

never exceeds 38.5°; the subjective symptoms are slight or moderate, often in striking contrast to the considerable swelling.

Polyarticular Chronic Rheumatism, which develops directly or as the termination of the acute and subacute forms, is distinguished from hydrarthros merely by its localization in several joints.

Periarticular Blenorrhagic Rheumatism.—In both sexes this begins with a prodromal stage of malaise and dragging pains in the limbs. Suddenly a joint becomes swollen, but the exudation is not situated in the cavity of the joint. There is, on the other hand, marked infiltration of the periarticular tissue and firm œdema of the integument. The joint then appears to be thickened and deformed in a manner similar to that observed in gout. The pains are moderate, the fever is quite high at first, but soon disappears. The mobility of the joint is usually unaffected, indeed abnormal mobility may result. The affection generally recovers, but ankylosis is also observed.

Blenorrhagic Tendo-vaginitis.—This rare disease, which was investigated chiefly by Maymou, develops at all periods, but usually in older blenorrhœa, after the third week of its existence. It begins with chilliness and slight fever, followed by pains — one to several hours in duration — which appear and disappear in this or that joint or tendon. Finally the pain becomes fixed in the sheath of a tendon, which becomes the site of a doughy, painful swelling that simulates fluctuation; it often extends quite a distance along the tendon. At the same time the hitherto pale skin assumes a rosy to dark-red color, and finally becomes the seat of an often painful œdema. In the beginning of the acute stage the pain is violent and spontaneous, and is increased on pressure and movement. Later the spontaneous pains diminish, but the pain on movement often remains long after the swelling has disappeared. The disease attacks either a system of tendons which possess communicating sheaths, or separate tendons. The extensor digitorum communis, flexor pollicis, dorsal flexors of the toes, are the ones attacked most frequently. The acute stage, which lasts a few days, is followed by remission of the inflammatory symptom, but a period of several weeks always elapses before the exudation is entirely

absorbed. Fresh infection or relapse of the blenorrhœa is followed by relapse or renewed disease of the sheath. The synovitis is very often combined with the various forms of arthritis.

A series of *nervous, "spinal" symptoms* follow gonorrhœal rheumatism in rare cases and occasionally follow the gonorrhœa directly. Gutherz (1852) described a case of obstinate neuralgia of the internal pudendal nerve in a patient suffering from gonorrhœa, and which recovered at the same time as the latter. Fournier (1868) observed obstinate sciatica, which returned with every fresh infection, in men who suffered from gonorrhœa, with or without synovitis. Coutagne reports two cases of blenorrhagic arthritis with crural and inguino-scrotal neuralgia. Gaillard reports two cases of double sciatica with gonorrhœal epididymitis. Urdy (1878) calls attention to the fact that gonorrhœal rheumatism is apt to be complicated by muscular atrophy, especially of extensors of the large joints. This observation has been confirmed by many other writers. Numerous writers have observed in addition a series of other symptoms, such as cincture pain, paræsthesiæ of the legs, increased cutaneous sensibility and reflex excitability, spinal tenderness and muscular spasms, so that they speak of a concomitant "spinal affection" in their cases.

Pathological Anatomy.

Although the number of autopsies in gonorrhœal rheumatism is not very small, we do not obtain from them a picture of the common benign forms, because the fatal cases are malignant but rare forms, which run an acute progressive course.

Fournier reports an autopsy on a case of acute suppurative blenorrhagic arthritis of the elbow. The joint was filled with pus, the articular cartilages eroded and entirely separated from the ulna, which was laid bare. Haslund describes four cases of purulent blenorrhagic arthritis, in one of which, that necessitated amputation, the knee joint contained ichorous pus, the cartilage was destroyed, the ends of the bones eroded, the periosteum separated by suppuration high up on the femur.

In a case of suppurative blenorrhagic rheumatism in a soldier, æt. twenty-five years, who died of pyæmia, Wyszrmirski found pus in both elbow joints and the left shoulder joint, and

demonstrated gonococci in the pus. Pollard presented, before the London Pathological Society, specimens from a woman of nineteen years, who had suffered for thirty-six days from vaginal blenorrhœa. She suffered from fever, pain in the knee and stiffness of the right hip, and died of embolism of the pulmonary artery. The autopsy showed embolism of the left common iliac vein, the internal iliac and vaginal veins. The knee and hip joints contained pus, the articular cartilages were eroded.

Punctures and incisions furnish us with information concerning the nature of the exudation in cases which run a favorable course. Volkmann punctured a knee joint which was the seat of gonorrhœal rheumatism and removed four ounces of a mucous, greenish, slight cloudy fluid, which deposited, after standing, a sediment consisting of pus cells. The majority of the cells presented fatty degeneration; no epithelial cells were found. Laboulbene punctured the knee joint in two cases and evacuated a deep yellow fluid, consisting of sticky, alkaline, purulent, cloudy serum; it contained pus corpuscles and fibrin, but no mucin. In one case Haslund removed about three ounces of sero-purulent fluid.

The punctures were also decisive as regards the question of the presence of gonococci. Petrone (1883) was the first to demonstrate them in the fluid of blenorrhagic arthritis. Kammerer also found numerous gonococci in one of two examined cases. Horteloup found them in a blenorrhagic sterno-clavicular joint. In the fluid aspirated from an inflamed knee joint Hall found large epitheloidal cells and a few pus cells, with gonococci in both as well as free in the exudation. Smirnoff detected groups of gonococci in the pus cells of a sero-purulent gonitis. We have already mentioned Hartley's positive cases. A few negative observations, on the other hand, have also been reported.

Deutschmann (1890) has recently made a positive demonstration of gonococci in gonorrhœal arthritis. Lindemann (1892) and Stein (1892) have also obtained positive results by pure cultures.

The findings of gonococci are thus contrasted with the fatal cases of Haslund, Wyzemirski, and Pollard, which create the impression of pyæmic disease. We are therefore justified in the opinion that gonorrhœal rheumatism some-

times develops as a true blenorrhagic affection, sometimes as a mixed infection, a pyæmic complication.

In regard to other rheumatic affections, we only have Pollosson's (1888) findings in a case of blenorrhagic synovitis. He found a muco-purulent fluid in the sheath of the tendon, and fungous granulations upon the parietal wall of the sheath and in longitudinal strips upon the tendon itself. Unfortunately no examination for gonococci was made.

Diagnosis and Prognosis.

The diagnosis of gonorrhœal rheumatism is evident from the symptoms. One of the most important diagnostic factors is the well-established fact that gonorrhœal rheumatism always exhibits a tendency, after it has appeared as a complication of clap, to return after fresh infection. The diagnosis is therefore undoubted if we learn from the patient that he also suffered from rheumatic symptoms during one or more previous claps.

The diagnosis is more difficult in a first attack of urethritis, or in a later infection in which rheumatic symptoms appeared for the first time. The possibility of the simple coincidence of clap and an independent genuine rheumatism cannot be laid aside. But even here there are certain data which furnish guides to the correct diagnosis. These include: 1. The small number of joints involved. Gonorrhœal rheumatism, often monoarticular, is rarely as polyarticular as genuine rheumatism, and seldom attacks more than two or three joints. Even in polyarticular blenorrhagic rheumatism the disease rarely attacks two or more joints at the same time with the same acuteness. 2. Diminished intensity and duration of the acute symptoms as compared with genuine rheumatism. The fever and pain are not as marked as in genuine rheumatism, and disappear more rapidly, so that there is soon a disproportion between the persistent objective signs of joint disease and the rapidly developing apyrexia and absence of pain. 3. The occurrence of exacerbations of the rheumatism coincidently with exacerbations of the blenorrhœa. 4. Treatment. The action of quinine, salicylic acid and antipyrin, which is so prompt in true rheumatism, is very slight in the gonorrhœal form.

The prognosis should be guarded. Apart from the possibility of the occurrence of pyarthros, with all its grave conse-

quences, complete recovery is often not effected even in the mild cases; the transition into hydrarthros may not be preventable, and thus the persistence of chronic disturbances (which are usually slight at first but are apt to be aggravated later on) must be regarded as a possible contingency.

Treatment.

The treatment hitherto has been a thankless task. Specifics are unknown, and we are therefore confined to symptomatic measures. Regulation of the hygiene and diet may prevent those influences which might cause an exacerbation of the blenorrhœa and therefore of the rheumatism. Heroic treatment of the gonorrhœa is to be employed with caution, because this is usually followed by temporary exacerbations of the urethritis, and these may influence the course of the joint disease.

In the recent acute stage we use antiphlogistics, but when the acute symptoms have disappeared and in the chronic cases we recommend absorbents, tincture of iodine, warm compresses, massage, sulphur baths, iodine preparations internally.

Taylor (1887) recommends oil of gaultheria, 10 to 20 drops, in capsules three to four times a day.

Rubinstein (1890) recommends potassium iodide, gr. xlv.–lx. daily; Rifat (1880) phenacetin, gr. xlv. a day, gradually increasing to ʒ ij.; Morel-Lavalée (1891) iodide of mercury, gr. iss. daily.

II. BLENORRHAGIC ENDOCARDITIS.

The knowledge that gonorrhœa may be complicated by cardiac affections dates back only to the middle of this century. Although blenorrhagic rheumatism was known earlier, many authors, for example, Trousseau, expounded the doctrine that it is never complicated by heart disease and is thus distinguished from genuine acute articular rheumatism. Brandes (1854) was the first to report two cases of blenorrhagic rheumatism—one his own case, the other reported by Lehmann—which were complicated, the first by endocarditis, the second by pericarditis. Hervieux and Sigmund also observed, the former endocarditis, the latter pericarditis, as complications of blenorrhagic

rheumatism. Desnos (1877) discusses blenorrhagic endocarditis and reported a fatal case with autopsy. Morel (1878) collected thirteen cases. Pfuhl mentions a case of blenorrhœa which was complicated by cystitis, conjunctivitis, polyarticular rheumatism, endocarditis and pericarditis, and recovered. Baudin reported a case of endocarditis without rheumatism. Up to date forty cases have been reported in literature.

Blenorrhagic endocarditis is, as we see, a rare disease which occurs in part as a complication of a rheumatism accompanying blenorrhœa, in part, but more rarely, as a direct complication of the blenorrhœa. Among the thirteen cases collected by Morel, in eleven the rheumatism and heart disease both appeared as complications, and only in two cases did the cardiac affection alone complicate the blenorrhœa. There is a striking predominance of the male sex. Sigmund is the only one who has observed the cardiac affection in women.

Concerning the etiology of the endocarditis we have been entirely in the dark, but Weichselbaum's case is calculated to shed some light on the question. In a patient who had an acute enlargement of the spleen, a gonorrhœa of three weeks' standing with mucous secretion containing gonococci, and who died of endocarditis, the middle aortic leaflet presented a deep loss of substance with abundant soft, grayish-white or grayish-red vegetations; the loss of substance extended to the adjacent aortic leaflet, to the mitral valve and through the wall of the aorta to the tricuspid valve; the free border of the left aortic leaflet was thickened. Streptococcus pyogenes was found by the microscope and by cultures in the vegetations on the valves. Hence endocarditis, like several other complications, must be regarded as the result of a mixed infection, and the gonorrhœa as an exciting cause which favors the invasion of the pus coccus.

Ely's case is analogous in many respects to that of Weichselbaum. The patient died after cerebral symptoms, which had terminated in left hemiplegia. The autopsy showed, in addition to blenorrhagic urethritis, congestion of the brain, old pericardial adhesions, recent vegetations of the mitral valve, enlargement of the spleen, which contained numerous small infarctions, and embolic foci in the kidneys. The mitral vegetations and the splenic and renal infarctions contained numerous pus cocci (staphylococcus and streptococcus). His

(1892), on the other hand, claims to have demonstrated the gonococcus in the ulcerations of ulcerative endocarditis in a patient who died with septicæmic symptoms.

It is evident, then, that endocarditis may develop as the sole complication of a blenorrhœa, and in rarer cases it may occur as part of a pyæmia following gonorrhœa. In the latter event it is always the result of a mixed infection. Whether the former is always the result of mixed infection is still doubtful.

In Leyden's case (1881) the pericarditis and endocarditis were also a part of pyæmia. The patient, who suffered from urethral gonorrhœa, was first attacked by epididymitis, then by arthritis of several joints, chills, high fever, loss of strength; he died of pulmonary œdema. The autopsy showed pericarditis, endocarditis of the aortic valve, splenic enlargement and infarctions, enlargement of the liver and kidneys.

The symptomatology differs in no respect from that of genuine endocarditis or of those forms which accompany true articular rheumatism.

The inception is either brusque, with high fever, chills and the general symptoms of serious illness, or it is gradual and accompanied by moderate elevation of temperature and gastric symptoms. In the former event the fever reaches 40° or even 41° C. The patient is then attacked by a feeling of oppression and dyspnœa, the heart's action is violent and irregular, and may present auscultatory signs even at this time. At the end of a few days a remission occurs; this may continue or it may soon be replaced by an exacerbation. Embolism may lead to a rapid fatal termination during the first or a subsequent exacerbation. Or the affection passes from a remission into a chronic stage, and a valvular lesion with its consequences develops. The mitral valve is attacked more frequently than the aortic. The endocarditis may be complicated with pericarditis, the latter very rarely develops alone. In the acute stage the disease may extend from the endocardium or pericardium to the myocardium, and acute myocarditis may lead to a fatal termination.

In addition to Weichselbaum's case autopsies have also been reported by Desnos, Schedler and Fleury. Desnos's case showed mitral and aortic insufficiency. In Fleury's case there was extensive destruction of two aortic leaflets.

The prognosis, like that of ordinary acute endocarditis, is always grave.

The treatment is similar to that of the ordinary form of the disease.

III. BLENORRHAGIC EXANTHEMATA.

In 1781 Selle said "that blenorrhagic pus may be absorbed and give rise to cutaneous eruptions." This fact was subsequently overlooked and the eruptions which appeared during gonorrhœa were attributed to the so frequently administered balsam of copaiba. In 1866 Pidoux again called attention to the possibility of the complication of blenorrhœa by cutaneous eruptions. I reported three cases in which blenorrhœa and cystitis were complicated by purpura rheumatica, in one of the cases also by pleurisy. In all three cases relapses of the blenorrhœic cystitis were followed by renewed swelling of the joints and purpura. Other writers have reported similar cases. In all the eruption belonged to the group of angioneuroses, the various erythemata, both erythema multiforme and nodosum, urticaria and purpura, and occurred either alone or associated with rheumatism. The symptoms presented no differences from the well-known course, so that we will confine ourselves to these few remarks.

Lang (1892) has recently observed an unique case which may be mentioned here. The patient, who suffered from urethro-cystitis, was attacked by acute circumscribed suppurative dermatitis of the dorsum of the hand. Gonococci in the pus were demonstrated by the microscope and by cultures.

IV. BLENORRHAGIC OPHTHALMIA.

Apart from the primary diseases of the eye which are due to direct communication of the blenorrhagic virus, blenorrhœa may also be complicated by secondary diseases of the eye, which develop with or without rheumatism. These are characterized as blenorrhagic affections particularly by the fact that they always exhibit a tendency to recur on renewed infection.

In the Reports of St. Bartholomew's Hospital (1852) are found a few cases of conjunctivitis and iritis which, together with rheumatism, complicated a blenorrhœa. Rollet described

a blenorrhagic iritis. Guénan de Mussy reports the history of a young man who, in two attacks of clap, suffered from rheumatism, conjunctivitis, iridochoroiditis and keratitis. Galezowski gives a detailed account of "iritis rheumatismale blenorrhagique." Koeninger reports the case of a young man who suffered, during his first clap, from rheumatism, during the second from rheumatism and iritis, during the third clap from rheumatism and iridochorioiditis. Panas describes, under the term "keratite ponctuée," a form of iritis with deposits on the posterior wall of the cornea, which he claims to be a frequent complication of clap. Interesting cases are also reported by Schenkl, Haltenhof, Mengin, Kipp, Colsman and Seely.

Blenorrhagic iritis, a quite rare affection, is usually associated with rheumatism as a complication of blenorrhœa. Among twenty-six cases collected by Jullien, three were combined with the monoarticular form, thirteen with the polyarticular form. The symptomatology is exactly like that of rheumatic iritis—discoloration and impaired mobility of the iris, contraction of the pupil, and distortion of the pupil in the rare cases of posterior synechia, photophobia, ciliary injection. The cornea presents a smoky opacity. On lateral illumination and examination with the opthalmoscope this opacity is found to consist of a series of opaque, whitish points, which are collected particularly in the lower half of the cornea, often in the shape of a triangle with the apex pointing upwards. The treatment does not differ from that of ordinary rheumatic iritis.

V. BLENORRHAGIC ADENITIS.

We have already discussed acute inflammation of the lymphatics of the penis in acute urethritis of the male. A similar acute lymphangioitis occurs, although more rarely, in the female. The lymphatics which pass from the clitoris and labia minora at the inguinal region, swell into round painful cords, over which the skin is reddened. In some cases the inflammation extends to the lymphatic glands, one of which, usually the nearest, swells into a painful nodule as large as a nut. It exhibits little tendency to suppuration, though this does take place in some cases. Bockhard found streptococcus pyogenes in the pus of such an acute suppurating adenitis, and it is therefore probable that we have to deal with a mixed infection.

In other cases, in cachectic, scrofulous, tuberculous individuals, multiple swelling of the glands occurs without symptoms of acute inflammation and almost without pain. This leads to the development of large bundles of firm glands, which remain unchanged for a long time, but are finally absorbed or undergo slow suppuration with the formation of fistulæ.

Finally, multiple painful swelling of the glands in both groins occurs in the beginning of very acute urethritis, but disappears with the acute stage of the primary disease.

The treatment does not differ from that of acute and chronic buboes.

Differential Diagnosis of	Acute Anterior Urethritis.	Acute Posterior Urethritis.	Acute Posterior Urethro-cystitis.	Acute Non-blenorrhagic Cystitis.	Phosphaturia.	Bacteriuria.
Secretion at the orifice of the urethra.	Abundant.	Less abundant and often contrasting with intensity of turbidity of the urine.	Slight and often contrasting with intensity of turbidity of the urine.	None.	None.	None.
Test of the two beakers.	First portion cloudy. Second portion always clear.	First portion very cloudy. Second portion cloudy, or clear and cloudy alternately; opacity always less than first portion.	First portion cloudy. Second portion always cloudy, difference in opacity of both parts not marked.	First portion cloudy. Second portion always cloudier than first.	Both portions equally cloudy.	Both portions equally cloudy.
Test of the three beakers.	First portion cloudy. Second and third portions always clear.	First portion very cloudy. Second and third portions cloudy, or clear and cloudy alternately; cloudiness always less than that of first part.	First portion cloudy. Second portion always cloudy. Third portion very cloudy, usually more than first part.	First portion cloudy. Second portion like first. Third portion more cloudy than first and second.	All three portions equally cloudy.	All three portions equally cloudy.
Test of two beakers after irrigation of pars anterior.	Two portions clear.	First portion cloudy. Second portion cloudy, or alternately clear and cloudy; cloudiness always less than first.	First portion cloudy. Second portion more cloudy than first portion.	First portion cloudy. Second portion more cloudy than first portion.	Both portions cloudy.	Both portions cloudy.
Reaction of urine.	Acid.	Acid.	Acid.	Acid or alkaline.	Feebly acid or alkaline.	Strongly acid.
Microscope.	Secretion and sediment of first portion: pus cells containing gonococci.	Secretion and sediment of both portions: pus cells containing gonococci.	Secretion: pus cells containing gonococci, also abundant bladder epithelium in sediment of both portions.	Sediment of both portions: pus cells, bladder epithelium, no gonococci, numerous bacteria.	Amorphous granules, groups of crystals of phospliate and carbonate of lime.	Numerous bacteria, few cellular elements.
Addition of acetic acid to the urine.	Cloudiness unchanged or increased.[1]	Cloudiness unchanged and slightly increased.[1]	Cloudiness unchanged or slightly increased.[1]	Cloudiness unchanged or slightly increased.[1]	Cloudiness clears.	Cloudiness unchanged.
Other characteristic symptoms.		Vesical tenesmus continuous or imperative hæmaturia with last drops of urine.	Vesical tenesmus, hæmaturia (from the pars prostatica).	Snotty pus in alkaline urine.	Very changeable, usually appears only once or twice a day.	

[1] It must not be forgotten that one of the processes may be complicated with phosphaturia, and the addition of acetic acid then produces partial clearing up of the urine.

Differential Diagnosis of	Chronic Anterior Urethritis.		Chronic Posterior Urethritis.	
	Superficial.	Deep.	Superficial.	Deep.
Secretion at the orifice of the urethra.	1. In more recent cases: mucopurulent secretion, constantly or as "good-morning" drop. 2. In inveterate cases: gluing of meatus, constantly or only in the morning, or meatus perfectly dry.		No secretion at meatus. (N. B.—Any secretion which may be present comes from pars anterior and does not exclude posterior urethritis.)	
Test of the two beakers.	First portion slightly cloudy, or clear with clap shreds; second portion clear without shreds.		1. In more recent cases: First portion slightly turbid with clap shreds; second portion slightly cloudy with or without Fuerbringer's hooks. 2. In inveterate cases: First portion clear with clap shreds; second portion clear with or without Fuerbringer's hooks.	
Test of two beakers after irrigation of the pars anterior.	Both portions clear.		1. In more recent cases: First portion slightly cloudy with clap shreds; second portion slightly cloudy with or without Fuerbringer's hooks. 2. In inveterate cases: First portion clear with clap shreds; second portion clear with or without Fuerbringer's hooks.	
Examination with urethrometer.	No diminution of dilatability.	Diminution of dilatability in one or more circumscribed spots.		
Other characteristic symptoms.	None.	None.	Increased or imperative tenesmus. Prostatorrhœa.	Increased or imperative tenesmus, prostatorrhœa, micturition or defecation spermatorrhœa, sexual irritative or paralytic symptoms; increased desire, frequent pollutions, precipitate ejaculation, pain on ejaculation, feeble erection, impotence, neurasthenia.

INDEX.

Abscesses, follicular and cavernous, 215
causes of, 219
diagnosis of, 221
prognosis and treatment of, 221
symptoms of, 215
Adenitis, blenorrhagic, 316
Arthritis, blenorrhagic, 306

Balanitis, 207
adhesions of prepuce in, 211
diagnosis and differential diagnosis of, 212
etiology of, 207
phimosis in, 213
symptoms of, 209
treatment of, 214
Bartholinitis, 293
chronic, 295–297
symptoms of, 294
treatment of, 297
Bladder, muscular apparatus of, 27, 30
inflammation of, 259
sphincter of, 31, 36
and urethra, differential diagnosis of diseases of (tables), 318
Blenorrhœa, complications of, in the male, 204
extension to subjacent tissues, 204
gonococci the cause of, 205
metastatic complications due to ptomaine intoxication, 207

Blenorrhœa, surface extension of, 204
Blenorrhœa in the female, 271
complications of, 290
diagnosis of, 275, 281
forms of, 274
frequency of, 273
gonococci, importance of, in, 276
gravity of, 274
latent, 272
pathological anatomy of, 280
prognosis of, 281
symptoms of, 297
treatment of, 282
urethritis in, 297
Blenorrhœa of the sexual organs, etiology of, 9
history of, 1
location of, in urethra, 45
para-urethral, 51
urethral, 23

Chordee, in acute anterior urethritis, 58
etiology of, 218
spasmodic, 58
venerea, 58
Compressor urethræ, 30
Corpora cavernosa, chronic induration of, 220
Cowper's glands, inflammation of, 222
diagnosis and differential diagnosis of, 225

Cowper's glands, perforation in acute, 224
prognosis, 226
symptoms, 223
treatment, 226
Cystitis, acute, 263
chronic, 264
diagnosis and differential diagnosis of, 265
etiology of, 260
mucous, catarrhal, 263
pathological anatomy of, 266
posterior urethritis in, 259
posterior urethro-cystitis in, 259, 261
prognosis of, 267
purulent, 264
treatment, 267

Endocarditis, blenorrhagic, 312
Endoscopes, 159
Endoscopy, advantage of, 166
technique of, 163
Epididymitis, complications of, 245
diagnosis of, 252
disease of vas deferens in, 243, 244
infiltration and induration of epididymis in, 248
pathogeny of, 239
pathological anatomy of, 249
prognosis of, 252
relation of treatment of blenorrhœa to, 239
seminal changes in, 247
symptoms of, 240
terminations of, 246
treatment of, 252
varieties of, due to position of testis and epididymis, 237, 244
Exanthemata, blenorrhagic, 315

Gonococci, as cause of complications, 205
characteristics of, 74
importance of, in blenorrhagic disease in females, 176
Gonococci, proliferation of, in connective tissue, 206
resistance of epithelial tissues to immigration of, 205

Hydrarthros, 307

Induration, chronic, of corpora cavernosa, 220
Infiltration, follicular and cavernous, 215
causes of, 219
diagnosis of, 221
prognosis of, 221
symptoms of, 215
treatment of, 221

Metritis, acute blenorrhagic, 297
chronic blenorrhagic, 298

Nephritis, blenorrhagic, 270

Oöphoritis, blenorrhagic, 300
Ophthalmia, blenorrhagic, 315

Perimetritis, acute, 300
chronic, 300
recurring, 300
Periprostatic phlegmon, 231
Phimosis in balanitis, 213
Prostate gland, anatomy of, 28
acute folliculitis of, 228
congestions of, 228
inflammation of, 226
Prostatitis, 226
acute, symptoms of, 227
chronic, 232
diagnosis of chronic, 233
pathological anatomy of chronic, 232
parenchymatous, 229
periprostatic phlegmous in, 231
prognosis of chronic, 233
suppuration in, 230
treatment of acute, 234, 235
Pus cocci in complications of gonorrhœa, 206
Pyelitis, 270

Rheumatism, gonorrhœal, 302
acute polyarticular, 307
chronic, 308
diagnosis and prognosis of, 311
etiology of, 302
pathological anatomy of, 309
periarticular, 308
site of, 304
subacute, 307
symptoms of, 304
treatment of, 312
Russian clap, 57

Salpingitis, 300
Seminal vesicles, inflammation of, 258
Spasm of urethra, 37
Spasmodic chordee, 58
Spermocystitis, acute, symptoms of, 258
chronic, symptoms of, 258
Strictures in chronic urethritis, 144
Suspensories in acute urethritis, 95
Syringes, urethral, 106, 114

Tendo-vaginitis, blenorrhagic, 308
Thompson's test for location of urethritis, 53

Urethra and bladder, differential diagnosis of diseases of (tables), 318
calibre of, 24
dilatability of, 25
divisions of, 27
measurements of, 27
muscular apparatus of, 27
spasm of, 37
Urethral blenorrhœa, 23
anatomical and physiological remarks on, 23
Urethritis, diagnosis and differential diagnosis of, 73
Urethritis, acute, 41
anatomy of, 81
infection, modes of, 41
instrumental remedies in, 105
prophylaxis of, 92
Urethritis, symptoms of, 45
treatment of, 90, 97, 118
Urethritis, acute anterior, 46
chordee in, 58
course of, 59
disturbances of discharge of urine and semen in, 58
florid stage of, 49
general symptoms of, 59
inflammatory symptoms in, 50
period of incubation, 46
prodromal stage, 48
prognosis of, 79
relative frequency of, 65
secretion in, 52
sexual irritative symptoms of, 56
subjective symptoms of, 56
treatment of, 119
Urethritis, acute posterior, 62, 259
albuminuria in, 71
anatomy of, 81
course of, 73
forms of, 72
general symptoms of, 72
period of development of, 64
prognosis of, 79
relative frequency of, 65
secretion in, 70
sexual irritative symptoms in, 70
symptoms of, 66, 70
treatment of, 133, 137
Urethritis, chronic, 138
anatomo-pathological changes in, 171, 175, 179
diagnosis and differential diagnosis of, 181
dilatation in, 192, 200
etiology of, 138
forms of, 194
gonococci in, 150
infectiousness of, 154
localization of, 155
pathological anatomy of, 169
phosphaturia in, 187
prognosis of, 188
secretion in, 149

Urethritis, symptoms of, 141
treatment, 189
Urethritis, chronic anterior, 143
strictures in, 144
Urethritis, chronic posterior, 145
Urethrometers, 26
Urethrotomes, 192
Uterus and appendages, inflammation of, 297
Urogenital diaphragm, 29
Vaginitis, 282
diagnosis and prognosis of, 285
symptoms of, 283
treatment of, 286
Vas deferens, disease of, in epididymitis, 243, 244
Vulvitis, 290
diagnosis of, 292
symptoms of, 290
treatment of, 292

LIBRARY OF CONGRESS
0 022 194 768 A